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PROCEEDINGS AND ADD

AT A

SANITARY CONV

HELD AT

TRAVERSE CITY, MIC

AUG. 24 AND 25, 1

UNDER THE DIRECTION OF A COMMITTEE OF
HEALTH AND A COMMITTEE OF CITIZENS O

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BO
YEAR 1887.]

[Reprint No. 262.]

MICHIGAN STATE BOARD OF HEALTH
SEAL.

BY AUTHORITY.

LANSING, MICH.
THORP AND GODFREY, STATE PRINTERS
1888.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

TRAVERSE CITY, AUGUST 24 AND 25, 1887.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1887.

Thorp & Godfrey, State Printers and Binders, Lansing.

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RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinion expressed therein.

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT TRAVERSE CITY, MICH. AUGUST 24 AND 25, 1887.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1887.

This convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Traverse City, acting with a committee of the State Board of Health.

The following named persons constituted the local committee: B. D. Ashton, M. D., Chairman; E. L. Sprague, Hon. Geo. E. Steele, S. C. Despres, Dr. J. K. Elms, S. E. Wait, Secretary.

The committee from the State Board of Health consisted of Henry B. Baker, M. D., Lansing.

The officers of the convention were: *President:* Frank Hamilton; *Vice-presidents:* Hon. S. C. Moffatt, Traverse City; J. J. McConkie, M. D., Walton; James Brady, M. D., Leland; H. A. Sifton, M. D., Sutton's Bay; G. H. Bailey, M. D., Elk Rapids; D. W. Connine, M. D., Wexford; E. B. Babcock, M. D., Williamsburg; M. S. Brownson, M. D., Paradise; *Secretary:* S. E. Wait, Traverse City; *Assistant secretary:* A. Arnold Clark, Lansing.

Among those in attendance at the convention were the following: H. A. Sifton, M. D., health officer, Sutton's Bay; S. J. Hutchinson, M. D., health officer, Northport; Eli Hughes, M. D., Hillsdale; V. C. Vaughan, M. D., Member of the State Board of Health, Ann Arbor; Henry F. Lyster, M. D., member of the State Board of Health, Detroit; Arthur Hazlewood, M. D., member of the State Board of Health, Grand Rapids; and Henry B. Baker, M. D., secretary of the State Board of Health, Lansing.

First Session—Wednesday, August 24, at 2:30 P. M.

The Convention was called to order by the president, Frank Hamilton. Rev. Geo. H. Cate opened the Convention with prayer. Hon. Perry Hannah, president of the village, then delivered the following address of welcome:

ADDRESS OF WELCOME.

BY HON. PERRY HANNAH, PRESIDENT OF THE VILLAGE.

Mr. President, Ladies and Gentlemen:

It gives me great pleasure to welcome you to Traverse City, to give your time and thoughts to the sanitary necessities that are so important for the welfare of the present and coming generations of the world.

How to make man live so as to avoid the ills of life and reach the highest physical condition that nature designed for him, is one of the great problems of the age.

The scientist digs out of nature's laws a way to utilize the steam, the telephone, the telegraph, and a thousand other hidden secrets that add to the convenience and pleasure of living, but man seldom gives attention to many important laws in Nature's great book until necessity begins to knock loudly for reform. And is it to be wondered at in these new and sparsely settled parts of our land where room is more plenty than population? A few years ago when I rambled through the Indian trails where now stands our pleasant village, I little dreamed that I should to-day be welcoming a "Sanitary Convention" to take into consideration the necessities that are to-day apparent before us; but I can assure you that I realize the great importance of laying our plans and giving the right direction to good sanitary measures, if we would grow up a town that will leave to those coming after, a monument of our well doing.

I am proud to say to you that Michigan stands among the foremost of our states in its liberality in advancing all questions of importance to her people, and while we can boast of a climate equaled by none, with pure air and good water, we should not neglect any sanitary progress that may benefit the human race.

Progress is the locomotive on which we should ride if we would keep up with the necessities that will constantly increase with increasing population.

I congratulate you on doing us the honor of selecting Traverse City where abound pure climate, clear water and fresh air, where your brains may work clear and easy, looking thoroughly and deeply into the great questions that you are here to discuss; and if you shall bring forward a single sentiment that will improve our health and well-being you will have left a legacy which will be of more benefit to Traverse City than silver and gold.

Allow me in behalf of our citizens to thank you for the compliment you have paid us, and say that any assistance that we may be able to render you in these discussions we will be glad to give.

PRESIDENT'S ADDRESS.

BY FRANK HAMILTON, OF TRAVERSE CITY.

One of the most hopeful signs of the times is that more and more men are beholding each other "face to face." No greater fallacy exists, no idea more detrimental to the human race prevails, than that of separation and antagonism between peoples, professions and societies. While an apparent advancement of a particular interest, or study, strengthened by the most strenuous efforts of a self-sacrificing student, is manifest, that interest fails of its highest measure until it has shed its accumulated light of intelligence upon and has coöperated with other interests in bringing both to their utmost attainments. In that we are beings dependent upon each other, the great law of love is paramount; and slowly but surely men called from above to "come up higher," are clearing the way for those, who are stimulated by an innate sense of responsibility toward their fellow men and who desire the civilization of all mankind, to advance step by step.

One of the most marked evidences of this progress is that those men who confront disease daily and hourly, endeavoring to save or prolong life, not only strive with a sickness already fastened upon the body, but unaided, unappreciated, even *combated* by those whom they are endeavoring to benefit, they attempt to ward off disease by educating the people, through the dissemination of knowledge by book, pamphlet and public convention. We cannot expect the coöperation of the masses in this great work until knowledge has been diffused, where ignorance now abounds. May the results of this State convention and coöperative work be shown by a quickened conscience, an awakened responsibility taking the place of indifference, and by the measure of human love growing deeper and stronger than the measure of money and selfishness.

Perhaps I can not better summarize the work of the State Board of Health in the past than by quoting from an article by its President, John Avery, read before the Sanitary Convention in Lansing, March, 1886:

"It has prepared, printed, and circulated among local boards of health, health officers, and the people, over 500,000 copies of monographs on different subjects relating to public health; it has collected records of sickness and deaths in different parts of the State and given the results back to the whole people; it has inquired into the causes of local epidemics and advised and warned such communities of their danger. It has investigated special causes of sickness, such as poisonous cheese, diseased meats, adulterated foods, and polluted water-supplies. The members of the Board have visited various places in the State where nuisances have been reported to them by aggrieved citizens, and advised as the remedy in such cases. They have visited, at the request of the Board of Corrections and Charities, poor-houses and jails in different counties of the State, called attention to their defects and pointed out how they might be improved. They have visited the prisons and other State institutions at the request of their officers or boards of control, to advise how their condition could be bettered; and their advice has generally been kindly and courteously received, and often acted upon to the improvement of such institutions. They have examined plans of public buildings about to be erected, and suggested alterations as to heating, ventilation, sewerage, drainage, plumbing, and lighting, and safety in case of fire, and their suggestions have been kindly and thankfully received and acted upon by architects and builders. And the results of these inspections of the plans of public buildings is, not only that the State has buildings better adapted to the uses for which ther are designed, but more attention is being paid to these details in building public halls school-houses, churches, and private residences, and in this way the comfort, safety, and health of the people are better cared for. They are in direct and frequent communication with every city, village and township in the State through their local boards of health and health officers. They act

as a sort of central signal station to which signals of alarm and danger are sent from every part of the State and from which warning is sent to the endangered and advice to the afflicted."

We owe a debt to our State Board of Health for its efforts to enlighten the people upon matters conducive to health, happiness and longevity. Men who have risen above and are superior to their professions and occupations are the men who are the public benefactors of to-day. Physicians, admitted into every home, see with trained vision, unknown to us, the polluted soil, the tainted water, the adulterated food, the lack of ventilation and a host of dangers in our surroundings; they welcome anything which will stimulate men and women to properly care for their homes, which will arouse them to their responsibility for the preservation of the health not only of their own families, but of their neighbors, by the prevention of disease—disease caused more frequently by subtle germs than by open and visible agents. Whatever advantage nature has accorded in the site of our dwelling places, man by his ignorance or indifference may soon destroy; therefore it behooves one to guard well the gifts held within his grasp, and to check the tendency towards pollution, by educating the ignorant and arousing the indifferent. The personal and public responsibility of each citizen is of the greatest significance. The official guardians of health, the physicians, the boards of health, the students of sanitary science, may pour upon us their vast stores of knowledge, they may convene, resolve, agitate and discuss, but without the hearty response and coöperation of the citizen their efforts will prove of little worth in raising the standard of health and the value of human life. We believe that Traverse City is about entering upon a period of substantial growth and prosperity. The enterprise of our citizens is most manifest where moral, educational and industrial interests are at stake; we pride ourselves upon our natural advantages as a commercial center, our situation so delightful to the visitor; and true it is, that our reputation abroad marks our village as famous for its neatness and healthfulness; but as our population increases, as age settles down upon us, possibly we may find to our sorrow that, unseen by human eye, there are lurking about us germs of disease which will prove fatal in the end to many. When a sanitary convention was first proposed here we instinctively turned to ask, "What good will it do?" Our city is new, bright, clean, sunshiny, high, drained by the rapid current of the Boardman, bathed by the waters of Lake Michigan, abounding in well kept homes, with no apparent cause of malarious diseases, with perfect immunity from cyclone, flood or earthquake. Why should death come to us at all unless summoned by some patriarch weary of the mere weight of years?

"Oh wad some power the giftie gie us,
To see oursels as others see us."

My office here is not to discuss a topic nor to disclose a mystery—these men who have made this study a life work will do that as they come from library, study, or office, to give to us of their wealth of research and experience; and while presiding over the mere form of this meeting, I would welcome the public as cordially as I introduce the speakers.

THE CAUSES AND PREVENTION OF INSANITY.

BY J. D. MUNSON, M. D., MEDICAL SUPT., NORTHERN MICHIGAN ASYLUM FOR THE INSANE.

In discussing this subject I shall be obliged to limit myself to some of the more common causes which lead to brain exhaustion, and to a few remarks concerning their prevention.

The causes of insanity may be divided into the predisposing and the exciting. In the first group we shall find heredity, age, sex, occupation, etc., etc., and in the second all those causes "which arise from conditions in the life history of the individual,"* such as intemperance, domestic infelicity, ill health, overwork, and many more which need not be mentioned in this connection.

Of the predisposing causes of insanity, "ancestral taint" is of most importance. Heredity is acknowledged by nearly all physicians to be a very important factor in the etiology of certain diseases, and it is well known to be an important factor in the evolution of certain traits of character in the individual. Without doubt it may be said that the laws of heredity have much to do with "the destinies of mankind—of the race and of the individual." That out of those hereditarily predisposed to insanity a large number, sooner or later in life, find their way to an asylum there can be no question. Out of 492 patients, consecutively admitted to the Northern Michigan Asylum, nearly sixty per cent came from neurotic stock. This would appear to verify what Dr. Clouston has said† in reference to such organizations, that there are some brains so unfortunately constituted that very slight causes indeed, either from within or from without, will upset them. They are unstable from the beginning, and may lose their balance sometime in life. If one thing does not produce this effect on them another will. In the puerperal cases that have come under our care, for example, hereditary predisposition to insanity was present in nearly 50 per cent, while in our epileptic cases the percentage of heredity was still greater than this.

Can hereditary tendencies to mental disease be modified, and, if so, by what means? This is surely a part of the question before us and the reply must be in the affirmative; and the means are judicious education and training of the young, and moral and proper legal restrictions to limit the number of indiscriminate marriages. The training of those predisposed to mental disease should begin in childhood. Parents must school themselves in the laws of health so as to be able to maintain a just physiological balance between the mental and physical growth of their children. The significance of this will be clear if it is recalled that an active mind may be united to a frail body, and that in such instances much attention must be given to physical development. Many brilliant children have been injured by overlooking this one-sided growth. Children should be taught the necessity of obedience and truthfulness, and above all, the necessity for self-control; and as they grow in years and in intelligence they should be admonished about certain vicious practices and taught the dangers which attend the abuse of

* Yellowlees. Boston Med. and Surg. Journal, vol. 113.
† Journal of Mental Science, vol. 30, p. 126.

alcoholics and narcotics. As in childhood and early youth much is acquired by imitation, the associations of these periods of life cannot be too carefully guarded. One vicious boy may be the cause of great mischief to many others, and at best the unrestrained freedom of the streets does not tend to the formation of the highest character in the young.

In school, too, children should be carefully individualized. "It is utterly unphysiological to assume that all brains are alike and can acquire with equal ease."* Some must be encouraged, others repressed in study or "great hardship and injury may be inflicted."* No matter what the curriculum of school may be, principles should be taught before things, and "the lessons of experience which actually do guide men in the conduct of life"† before mere accomplishments. No matter how carefully children predisposed to nervous disease may be trained, some will early show signs of brain failure. Parents must necessarily be first to notice threatenings of danger, and should seek medical advice. In such instances a very grave responsibility is placed upon the physician. It is needless to say that he should be especially skilled in his profession and by this skill be able to correct the disordered nervous mechanism at fault.

Much, undoubtedly, can be done by persons predisposed to insanity in the way of self prevention. "When a man knows that he is constitutionally liable to this disease it certainly behooves him to shelter his mind from the shocks and trials of life as much as he possibly can and to content himself with less ambitious flights than what he might desire; to check his nervous irritability, not only by struggling against it, but by placing his bodily health in the best possible condition; to learn the laws upon which mental no less than physical well-being depends, assured that whoever else may break them with impunity, he shall not be permitted to escape; that the remorseless Sisters will undoubtedly spin and cut the thread of his mental life in accordance with his original taint unless he evades their scissors by cautiously directing his course at a safe distance from their range."‡

Dr. Yellowlees wisely says the first condition of brain health (as it is the first condition of health of every organ) is due and suitable exercise. "Exercise, whether for duty or pleasure, implies and procures rest; and for the subject of nerve instability, sufficient and complete rest is indispensable. Rest should not be mere languid laziness, but genuine nerve repose." Exercise he would have combined with relaxation and rest, but while "these are essential to brain health they are not everything." "Our emotions and affections are the mightiest factors in our lives and they afford a vast field for manifestations of nerve instability. It is in the regulation of our moral nature, and in controlling our fancies, impulses, and passions, by reason and duty, that the hardest battle must be fought."‡ Many men each year lose their health by too prolonged and excessive application to business and to work.

The laws of heredity are not absolute, if so, there could be no permanent development in the race. Nerve degeneracy seldom extends through more than one or two generations. This is because nature ever aims at a perfect type; failing in this, she will not allow her laws to be transgressed. Decay and finally extinction are the penalties she inflicts for neglect of them.

Our asylum statistics seem to prove that neurotic people are prone to inter-

*Yellowlees. Boston Med., and Surg. Journal, vol. 113.
†Maudsley. Pathology of Mind.
‡ Tuke. Insanity and its Prevention, p. 175.

marry. No doubt "excitable, unstable folks have an attraction for each other as remarkable as it is unwise."* These indiscriminate and unphysiological marriages are the cause of much misery and misfortune. The remedy readily suggests itself, but as society is at present constituted not easy of practicable application. Whether certain neurotic people should marry or not is a very delicate question, the solution of which must be left to a higher civilization than ours—a civilization which will insist upon the adoption of "rational principles of natural and sexual selection in the propagation of our species."† It should not be forgotten that parents have it largely in their power to prevent these unphysiological marriages on the part of their children.

While I do not think that an occupation properly pursued can be considered as predisposing to insanity, yet we find from our records that a large number of our patients are farmers, farm laborers or their wives and children. We have no means of knowing what percentage this class bears to the whole population, or of knowing the amount of mental disease in this as compared with other occupations, yet it would seem from our statistics that farm pursuits favor the development of mental disease. From an analysis of these cases we find that many of them were of the neurasthenic type; that the mental break-down had been in many instances preceded by prolonged debility or ill health. Surely there is much in the life of those engaged in farming that is conducive to health, especially the open air life and the comparative freedom from business competition which it insures. On the other hand farm life is frequently monotonous, often associated with undue physical strain to which is not infrequently added the worry of debt or that of providing and caring for a large family. A person who begins work at four or five in the morning, and continues it till night each day without social break or the modifying effects of reading books or papers, must not be surprised if he sooner or later finds himself shipwrecked in physical or mental health, or in both. It is almost the inevitable result of such a struggle. It is against this continual daily grind that I would especially plead, and that without reference to any occupation. It is eminently just to have some aim in life, but we should not become selfishly absorbed in its attainment. We should constantly bear in mind that we are each one of us an atom in a great social fabric, and that we must pause ever and anon in our labors to contribute our mite to the good of others. We would say, with due respect to all toilers, introduce as much variety into life as possible; cultivate sociability, attend church, afford to yourselves and families an occasional holiday for rest and recreation; make your homes bright and cheerful, inspire your children with love and respect, and withal you will find that wealth, and all that the world most admires, will come with less anxiety, and that your health and happiness and that of your wives and children will be immeasurably increased. God has endowed us with "organs and attitudes fitting us for a certain weight and variety of moral and intellectual development,"‡ and he who "makes no use of them but allows them to waste and degenerate, is in favorable condition for the occurrence of some form or other of more positive mental derangement."‡

The exciting causes of insanity are so numerous that it would be less difficult to mention what has not been, at one time or another, assigned as a cause,

* Yellowlees. Boston Med. and Surg. Journal, vol. 113.
† Spitzka. Insanity, etc., p. 309.
‡ Maudsley. Pathology of Mind.

than to mention what has been. Some of the exciting causes are general in the sense that they may affect any one and that independently of mode of life. In this group may be placed as an illustration insanities secondary to fevers. Preventive measures, which lie largely in the province of State medicine, are necessarily indirect, and consist in limiting the effect and the spread of the special poison to which the fever is due. State medicine has done much, within the past few years, to limit the spread of contagious diseases and to teach the masses the necessity of preventive medicine in certain directions. By diminishing suffering and prolonging life, it indirectly prevents insanity.

No epidemic sweeps the country without leaving in its train numerous mental wrecks. Little more need be said concerning these general exciting causes or their prevention. Everything that tends to promote the public health will lessen the occurrence of insanity in the commonwealth.

The special exciting causes of insanity are those due to vicious habits of life in the individual; and intemperance and the social evil are those fraught with the gravest effects on the mental organization. Our people are fast awakening to the importance of checking the further growth of these evils. Intemperance not only too frequently strands its victims, but, alas, it is the father of various forms of nerve degeneracy in their offspring. Of the "social evil" is it not startling to be able to read of the existence of a modern Sodom in this year of grace? Is there a city in our proud state without its institutions of vice? It will suffice to say that the most fatal form of mental disease is specific in origin and the number of cases is legion. What is the remedy for these evils? Primarily every effort of thinking people must continue to be exerted against them; the young must be taught their dangers, and the law must be enforced to compel those who will not listen to reason to conform to the judgment of those who have the best welfare of the human race at heart.

DISCUSSION.

Mr. Perry Hannah, of Traverse City: I notice that Dr. Baker, secretary of the State Board of Health, of Lansing, is in the hall, and I know our people would like to hear him on this subject.

Dr. Henry B. Baker: I had not intended to discuss this subject. However, I am glad to have heard the paper, and move that we extend to Dr. Munson a hearty vote of thanks for his able paper. This motion prevailed.

Geo. E. Steele, of Traverse City: I often thought when this institution was being erected, well knowing that there were other and larger asylums in the State, under the direction of State officials, that we were hastening to the time when every county would have its own asylum—when there would not be room for all the insane. As our population increases, it becomes a grave question,—what to do with with the insane. When our University was first founded it was a small concern, but if it keeps on growing the time will come when Washtenaw county will not hold it.

I have often wondered whether many of the inmates of our asylums were not brought there by drinking habits. I would like to have this matter touched upon by the physicians present. I think this element enters largely into the question of the deterioration of the nervous system.

Mr, Hannah: I would like to inquire whether the percentage of insanity is on the increase or not. If it is, whether it is because we are gathering in from the poor-houses and jails, and putting them where we notice them more than we did. I think this would be an interesting point.

Dr. Munson: I cannot speak from statistics. I think, however, the increase of insanity is more apparent than real. Unquestionably there is a large increase in the aggregate of the insane. The percentage does not exceed one to 500 of population. There has not been much increase of occurring cases for a few years past. In this district the ratio of recent cases is about 1 to 5,000, which is not far from what it was in 1870.

Mr. Hannah: Can the doctor tell us the ratio of increase in the rural districts as compared with our cities?

Dr. Munson: I regret that I cannot.

Dr. Baker: Dr. Dawson of the asylum is here. I think we ought to hear from him on this subject.

Dr. Dawson: I came here to learn of older men who are present. I can say, however, that I have studied the causes of insanity to a certain extent, and I do not find that the drink habit is accountable for all the insanity by any means. That it is a cause and a potent cause there can be no doubt but excesses in every direction are causes and strong causes. What would be a sufficient cause in one man would not be a sufficient cause in another; that is, people are differently organized and may be guilty of excesses without the same disastrous results.

Mr. Sprague: It is a fact that more than one-half, or as much as 75 per cent of the inmates of our asylums are foreign born. Can any of the asylum doctors give us the reason for this? This is a question that may have some bearing on the subject of immigration.

Dr. Munson: It is said that some European countries assist to supply us with insane and defectives. I do not know that this is true, at least we have but few cases in the asylum that were insane before coming to America. It is no doubt true that many persons coming to this country have lived for successive generations in the same hamlet, known but little of the world outside their own families and their immediate neighbors. Many of these people, if not insane, are from hereditary and other influences, extending through many generations, upset by many causes, among which are homesickness, and the greater strain that is thrown upon them by the high pressure activity which characterizes our country.

Mr. Wilhelm: The real reason why there is more insanity proportionally among the foreign born is that their habits at home are entirely different from what they are here. At home they work throughout the week at what they call hard work, but which in the United States would be looked upon as taking it easy, for here everything is done on the rush. On Sunday the majority of them go to church and the priest educates them to this idea, that as they do the work, he will do the thinking, which a great majority of them accept. Therefore their brains are not cultivated or strengthened. Therefore their brains are weak and can not stand much strain. When such people emigrate to the United States they think they are going to make an easy living, but on their arrival here they find that their skill is not equal to the task, therefore they get discouraged and homesick, while others, again, take hold with a will and soon commence to take up the American ways, and their brains are set to work in American ways. Now the change for a good many is too great, and, sooner or later, the weaker ones that overtax their brains will be found in our insane asylums. As pouring cold water on a hot stove does not always crack it, neither will overtaxing of the brain always create insanity.

Dr. D. B. Ashton, Health Officer of Traverse City: In reference to the foreign element, I believe that there are no more foreigners made insane by coming to this country than there would be if the citizens of the United States should go to some country that is foreign to their habits and mode of living. I can see that it would upset their minds very much for them to come to a country without understanding the language or customs. Their ancestors have lived in one place for centuries and their habits have become fixed, and I can see the force of Mr. Wilhelm's argument that it is not so much their habits of drinking as other causes.

Mr. Hannah: There is one thing I wish Dr. Munson would tell us. I have noticed that in bringing patients to the asylum it takes two or three men to get some of them there, but after they have been in the asylum a few days they are quiet. There seems to be something in the management of the patient that quiets him. There has been great improvement in the management of asylums in regard to restraining patients. I was visiting a city in New York State a few years ago and visited an asylum where there were about 1,600 patients. In going up hill near the asylum we broke a tug in the harness and it took us some time to repair the damage. This called a great number of them to the windows and they created a most tremendous noise. I have noticed many cases that required great skill and tact and I wish Dr. Munson would tell us the secret of his good management.

Dr. Munson: I do not know that I can answer this question satisfactorily. There is certainly no secret in our methods of caring for the insane. After a patient is placed in the asylum, he is permitted to do much as he likes, and finding others quiet and orderly is, I think, a great incentive to him for self-control. No restraints are used and he is always treated kindly.

Mr. S. Barnes, of Traverse City: I would like to ask if there is a difference in the percentage of insanity between the foreign born and the native born.

Dr. Munson: It is vastly greater in the foreign born.

Mr. Hannah: I notice that Mr. Moffatt, our representative in congress, is in the audience. I would like to ask him what influence politics has in causing insanity?

Mr. Moffatt: It seems to me that when we come to politics we find all men sane. They are all right on this subject.

Mrs. Dr. Thompson: This is a very interesting topic and one that concerns mothers. I would like to hear from some of the ladies present.

Mrs. Bates: There has not been much said on the side of the children and mothers. The only wonder to me is that all the mothers and housekeepers are not insane. I think if we could only devise some means by which the women, like the men, could have only one thing to do instead of a hundred all at once, it would be much better.

Mrs. Roberts: I am sure there is enough variety in woman's work, and insanity among women cannot be laid to monotony. I believe, however, that too many of our women overwork and, by so doing, pave the way to mental trouble.

Mr. Barnes: There is another question which I would like to ask the doctor,—is religious excitement an important factor in causing insanity?

Dr. Munson: I cannot think so. Some patients undoubtedly become insane from religious excitement, but these causes, just as any other causes affecting the emotions, would depend on the mental condition. Surely there is nothing in religion and in religious teaching that should tend to the causation of insanity. In fact I believe a true religious life should be and is conducive to mental health.

Second Session—Wednesday, August 24, at 8 P. M.

The convention was called to order by the President and listened to an instrumental duet by Prof. and Mrs. Scammel.

The following paper on the Present and Future Water-Supply of Traverse City, was then read by H. D. Campbell:—

THE PRESENT AND FUTURE WATER-SUPPLY OF TRAVERSE CITY.

BY H. D. CAMPBELL, OF TRAVERSE CITY.

I am not informed why you should call upon me to open the discussion upon the present and future water-supply of Traverse City unless it be from the fact that it has been my province during recent years to furnish a water-supply for this village from Grand Traverse Bay; or the need at this time of a sprinkling down to lay any dust that may chance to rise during this and following sessions; perchance as water enters into the life of everything, it may be taken as a stimulant by this convention. I believe the consideration of this subject is well and timely taken on this occasion just before the adoption of the Local Option in Grand Traverse County. Our village, containing a population of about 4,000 souls, is beautifully located upon a broad, sandy plain, elevated above the water level from two feet to twenty feet, with Grand Traverse Bay on the north and Boardman Lake on the south. The soil is coarse sand and gravel admitting of a free movement of ground atmosphere and water from south to north.

The present water-supply for domestic use in the main is not from Grand Traverse Bay, by way of the water-works, as may be supposed. Only forty-five families in the village have their dwellings connected with the water-works or obtain their supply for culinary purposes from that source. The present water-supply for family and domestic use is therefore largely taken from surface wells either dug or driven. Water is thus reached at from four feet to twelve feet in the west part of the village, and from six feet to sixteen

feet in other parts of the village, with exceptional instances of deep wells driven through the hard pan strata.

It is well known that water in these wells fluctuates (rises and falls) in correspondence with that in the bay on the north and more especially with the Boardman Lake on the south. From these wells is pumped what many householders call good, wholesome drinking water. This may be true in some instances. It is not a question of speculation whether this water-supply in the majority of wells, or (from the Grand Traverse Bay) through the water-works system is good or bad. Analysis demonstrates the fact that all water that is clear and odorless is always pure and wholesome. The pump, by no means as well as "the old oaken bucket dripping with coolness," may fail to bring health and safety from such sources. Because a man or family have used whisky or tobacco for forty years, more or less, it is not necessarily a wholesome beverage or practice.

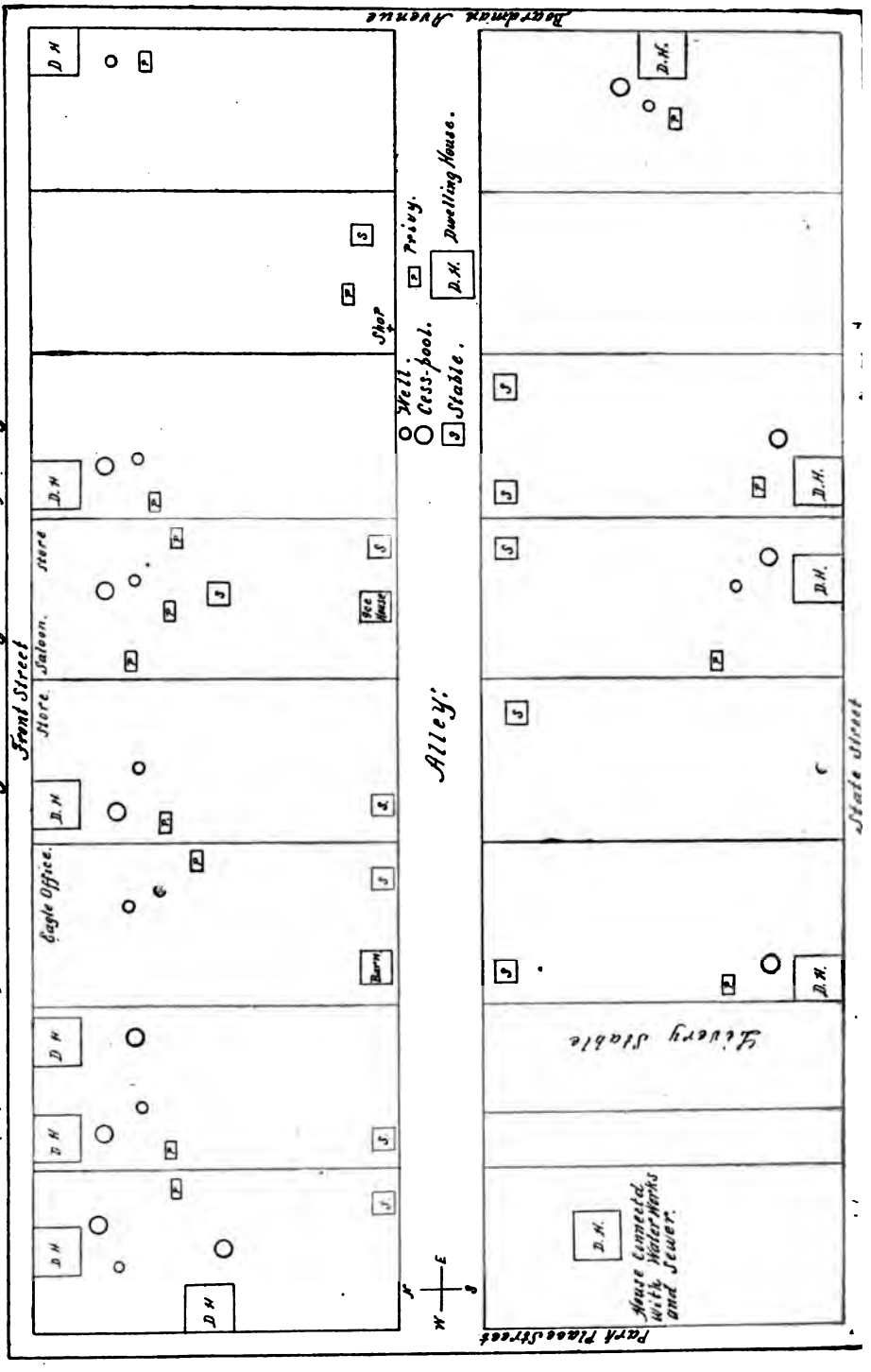
This water-supply problem is becoming one of no small importance to individuals, families, communities, villages and cities, as 75 per cent or more of what we eat and drink is said to be water and must affect the health of every citizen, and the death-rate of every town, village or city, in a like ratio as the water-supply used may be contaminated with impurities.

The peculiarity of the soil that underlies this village (sand and gravel) deprives it of any filtering power. Water passes through it as through a sieve or wire cloth, carrying with it any impurities that it may pass through in seeking the level. It is a perfect sewerage with a ground water movement from south to north, and so near the surface that water-mains are laid in it in the west part of the village, also on Front and Franklin street east.

It is evident from these facts that multitudes of privy pits, cesspools and other deposits of filth, now found in every block in the village, must sooner or later contaminate this entire plateau, and the sub-soil of this village must become a great cesspool.

Now if such be the facts, and I believe they are, and nine-tenths or more of our people take their water-supply from these shallow wells, the source of the present water-supply for domestic purposes is, to say the least, not very inviting.

Surrounded as we are with water on every side of us, pure and wholesome as the air we breathe, there seems to me but one remedy, and I appeal to you fellow townsmen, individually, that you determine from whence is to be taken the future water-supply for domestic use for the village of Traverse City.


Block (11) Eleven, Traverse City- Exhibiting relations of Privy-vaults, Cess-pools etc. to Wells.
Front Street
Bartlemay Avenue
Alley.
Fifth Place Street
State Street
Eagle Office.
Store
Saloon.
Store
Ice House
Barn
Livery Stable
Shop
D.H.
Well.
Cess-pool.
Stable.
Privy.
Dwelling House.
House Connected with Water Works and Sewer.
N
E
S
W

THE PRESENT AND FUTURE WATER-SUPPLY OF TRAVERSE CITY.

BY E. L. SPRAGUE, OF TRAVERSE CITY.

Pure and wholesome food and pure and wholesome drink are the prime factors in not only our well being, but our very existence; and of these two prime factors, pure drink is the most important. Of the various kinds of food suited to man's taste, health and well being, there are many, but there is no one kind of food that is universally acknowledged to be better than all others. In the matter of food, "What is one man's meat is sometimes another man's poison." Not so with drink, for while there are many kinds of drink too, yet everybody acknowledges that by far the best and the most essential of all is pure water.

In this paper I do not propose to prove to you that, among the most direct causes of disease, especially typhoid fever, cholera and dysentery, impure water stands by far the most prominent. I take this for granted, and if any one is inclined to be sceptical on this point I only ask him to read carefully the papers that have been read at previous conventions of this kind, and distributed by the State Board of Health.

Taking it for granted, then, that the necessity for having pure water is conceded, the inquiries that naturally arise and which interest us specially are: Do the people of Traverse City to-day use pure water; and if not, how can they obtain it? These are important inquiries, and, owing to the limited time I have had to investigate the subject, I greatly fear that I shall not be able to answer them satisfactorily to myself even, to say nothing of the effect upon your minds.

A partial examination of the water of ten or a dozen wells in town show that some of these at least furnish water that is unwholesome and unfit for use. This appears to be more notably the case with shallow wells. In the deep driven wells the water appears to be the best. Again, the water in the wells on what is known as the South Side is better than that on the East or West Sides.

It has been fully demonstrated that water does not purify itself, except to a very limited degree, in passing through a loose sandy soil such as ours, that in such a soil impurities arising from privy vaults or the slops from the back yards may be conveyed a long distance and contaminate the water with which they come in contact. And this fact to my mind accounts for the impure condition of the water of the wells upon the east side of the town. The water from Boardman Lake, which is 8½ feet higher than the bay, is all the time leaching through the porous soil and passing into the bay, carrying with it the drainage from vaults and slop holes, and wherever a well happens to be in line with this current the water of that well is contaminated and made impure; and, in my opinion, it is only a question of time when all the wells in Traverse City will become unfit for use, especially the shallow ones. Of course upon the South Side they will remain pure longer, because there is not the same motion of the water below the surface there that exists on the East and West sides. But the water below the surface does not remain still

even there. There are currents all the time passing through the soil that in the end will spread impurities over the entire territory.

It is only a question of time when the water of the wells in Traverse City will become unfit for use, unless a complete and effectual system of sewerage is adopted. But the sewerage question is one that I will not attempt to discuss, as it will receive better treatment from other hands.

Another source of water, which is being gradually introduced into our dwellings since the erection of our very efficient system of water-works, is Grand Traverse Bay. The water is now obtained about 500 feet from the shore and at a depth of about twenty feet below the surface. We have spent considerable time in examining this water under the microscope, and we find that there is a large amount of matter of a fungus character, some of a woody nature, and animalcules. Of the fungus and woody matter the mains contain the greatest amount. The animalcules exist in the mains, in the air chamber at the works; and also in the water taken at a depth of thirty-five feet below the surface in the bay at places over 100 feet in depth.

It has been claimed that animalcules exist in all water; that in fact every drop of water teems with life. This, if the best authorities are to be believed, is a mistake. Deep wells, and spring water in general, contain little or no organic matter. The presence of living creatures, vegetable or animal, discernable either by the naked eye or the microscope, is a proof of organic taint in the water, and is one of the tests of this kind of impurity. Whether these substances exist in our bay water as furnished us from the water-works to an extent that renders the water unsafe I am not prepared to say.

In the absence of proof to the contrary I should certainly say that water obtained from Grand Traverse Bay, at a depth of thirty feet below the surface, would be about as pure as anything in the way of water we could find. But we must admit that examination with the microscope tends to shake our faith in its purity, especially during the summer months.

Since the above was written I have been furnished with a copy of an analysis of the water taken from a hydrant of our water-works in November, 1884, made by Prof. Kedzie, of the Agricultural College. It is as follows:

LANSING, Mich., Nov. 24, 1884.

DEAR SIR:—By your direction I have made analysis of specimen No. 1, of water sent, with the following result:

Total solids in imperial gallons (10 lbs), 9 grains. This solid residue consisted as follows:

Organic matter	1.3 grains.
Carbonate of Lime	6.5 "
Carbonate of Magnesia	.6 "
Soluble Silica	.5 "
Carbonate of Iron	.2 "
Chloride of Sodium	Traces.
	9 "

The water is very pure and unusually free from mineral matter.

Yours, R. C. KEDZIE.

This is good enough, and would seem to prove that we need go no farther, that we have in abundance all the water we need, and of the best quality in Grand Traverse Bay. But as we have already stated, an examination with the microscope would seem to show a different state of facts. It may be that the season of the year has something to do with the matter, and it also may be that our microscopic examinations lead us to think the impurities are much greater than they really are.

At the solicitation of Dr. Baker, Prof. Vaughan kindly consented to help us out of our difficulty, by making an examination of several samples of our water, and for this purpose, a few days since, samples were sent him of water taken from the bay thirty-five feet below the surface, where the water was over 100 feet deep, also a sample from one of our hydrants, another from the deep driven well of Messrs. Despres & Montague on the north side of Front street, and another from the shallow drive well of Mr. S. E. Wait on East Washington street. The professor will no doubt give us the result of his examinations of these samples of water which will enable us to know positively from what source we ought to seek to obtain our water-supply.

There are very few if any open wells in Traverse City—all are "driven wells."

As we have already said, owing to the large amount of organic matter existing in the water of Boardman Lake and the very loose and porous character of our soil, which allows a constant passage of this water through it, directly underneath the vaults and yards, to seek a level with the water of the bay, all the water of our wells obtained at a depth above the level of the bay surface must be impure. And this I believe will always be the case even with the best of sewerage, although good sewerage will no doubt help the matter.

Wells driven down ten or twelve feet below the level of the surface of the bay now furnish water almost entirely free from organic matter, and except in a few localities give us good, wholesome and almost pure water. The exceptions to this are found on the south half of block 13, on Washington street. Here four or five deeply driven wells produce water so impregnated with sulphur as to be very unpleasant both to taste and smell. It may be possible to go down still farther and get below this vein of sulphurous water, but it has not been demonstrated.

Of one thing we feel quite certain, and that is that water taken above the sulphur deposit, while it looks clear and tastes pleasant, is unsafe to drink.

But I think I had better bring this paper to a close without making too many predictions or forming too many conclusions as to the good or bad qualities of our water at different places and depths, lest Dr. Vaughn's examinations may prove that I do not know what I am talking about, and I am not at all certain but that I have already gone too far to prevent this result.

DISCUSSION.

In the discussion of this subject, Dr. Vaughan referred to outbreaks of cholera and typhoid fever that had been caused by contaminated drinking water, and stated that typhoid fever was a disease that ought to be entirely prevented. Every death from typhoid fever is homicide. He referred to the different sources of drinking water,—(1) cistern water, likely to be contaminated by impurities in the atmosphere and on the roof, (2) surface water, likely to be contaminated by privies, cesspools, etc., and (3) subterranean water, depending for its purity on the purity of the soil through which it percolates. Whatever the source of the supply all water should be boiled. Filtering might not destroy the germs of typhoid fever; boiling the water would. A year ago a sanitary convention was held in a certain city in this State. This subject of typhoid fever and drinking water was discussed, and

yet, in a few weeks, some who attended that convention were dead from typhoid fever. It was too customary to regard such utterances as only "talk." Every one present should make a personal, practical application of these methods of prevention.

Pamphlets issued by the State Board of Health were distributed at this session bearing on the subject of water-supply and the influence of water-supply on the death rate.

Third Session—Thursday, August 25, at 9.30 A. M.

The Convention was called to order by the President. After prayer by Dr. Van Alstine, Dr. B. D. Ashton read the following paper on "The Work of the Village Health Officer":—

THE WORK OF THE VILLAGE HEALTH OFFICER.

BY HON. B. D. ASHTON, M. D., HEALTH OFFICER OF TRAVERSE CITY.

The duties and responsibilities of a village health officer are, or ought to be, much greater than are attributed to him by the people or even the fathers who created him. He ought to know all parts of the village, and, to do his duty well, he ought to know all parts of every house, from cellar to garret, for in too many houses there are wastes and sinks where the accumulation of nastiness, that produces foul and unhealthy gases, has been going on for years. There is one place in particular to which he should call the attention of every family, of which I have heard but very little said. I mean the pest closet,—a little dark room easy of access, with no ventilation, where the purification of neither light nor air can reach, and where each week are thrown the dirty stockings, old shoes and cast off clothing containing the excreta from the bodies of the whole family.

People breathe air thus contaminated and then feel languid and dull, and mope about until they get invigorated with the pure air that they have to get from the outside. They wonder why their children sicken without apparent cause. The doctor visits their families and prescribes, but he is too modest to tell them that their own filthiness is the cause.

What shall the health officer do? He knows these pest vaults exist in the house and out of the house, that the responsibility rests on him if they are not removed or disinfected, so that the danger may be obviated, and sickness prevented. He requires, orders and directs, but his advice is unheeded. Sickness enters the family, the doctor is called and talks very learnedly and intelligently about sporadic diseases,—one of the great mysteries to the profession over which he has no control and for which he cannot account, when with a little careful study and investigation he would find the propagating cause under the same roof where the enigma presents itself. Here the health officer can be made available, and with the physician commence a systematic investigation.

In the faithful and minute performance of duty the local boards should be the chief auxiliaries of the State board, for its effectiveness depends very much on the prompt, intelligent and strict compliance with the law and instructions by the local board. Upon them the State board must rely, and it is by this means it is enabled to intelligently comprehend, advise, instruct and direct. In fact the State board is useful to the State only in proportion

to the information it acquires from the different localities through these auxiliaries.

The State board has studiously sent to all parts of the State carefully prepared questions bearing on the topography, water-supply, the restriction of communicable diseases, etc., of every place where there is a health officer, and with a complete answer to these questions the State is a panorama before the board, every part of it familiar, and thoroughly understood. And I would like to say right here that I wish you knew more of its labors, the eagerness and anxiety with which it seeks information. No Pinkerton detective ever followed and shadowed a criminal more assiduously or shrewdly than this board watches the appearance of a contagion or epidemic. I believe it is the most industrious and painstaking body that I know anything about, and I bespeak for it the hearty coöperation of all local boards and health officers. The laws, regulations and instructions advised by the State board of health are many, but they are plain, and it is the duty of the health officer to make himself familiar with them in every detail, for on these details very often hangs the key to the whole mystery of prevention. Such intelligent advice and instructions are given as will obviate an epidemic, prevent a scourge and successfully combat or starve out a contagion, thereby saving many lives and an endless amount of suffering, misery and anxiety.

The local health officer should carefully investigate all apparently existing causes of disease, make a survey of the premises where an epidemic first makes its appearance, ascertain the location of cesspools, water closets, wells, whether they are open or driven, and investigate all suspected causes. He should transmit this information at once to the State Board, and, in nearly every case, he will receive such assistance that the source of the disease may be removed, and its further spread prevented. How is this result to be accomplished? "We know that all advances in civilization (and this is part of it) are founded on enlightened self interest, rather than on philanthropic or humane motives, and the most superficial observer of human nature corroborates this." The practical business man is generous enough in giving his money and time voluntarily for charitable or other purposes, but he strenuously protests against any increase, however small, of their demands upon him, unless he can see a prospect of a profitable return from the investment. Now, when we give the subject such consideration as it deserves, and such time and attention as it ought to receive, is there not a fair prospect for a speedy and profitable return? Upon the good health of a people their prosperity and happiness depend. Will we give it this attention here? We never have; and it is a most astonishing fact that a people who look well to their business interests, who love and carefully provide for their families, who have a pride in their village, as we have in ours (where nature has done so much for us), who are enterprising in everything else, will entirely neglect and ignore all sanitation, and, without giving the subject a rational or intelligent thought, pronounce it a humbug. Then, when an epidemic comes,—when sickness and suffering are all around us, when the pale horse and his rider enter our homes, when our loved ones are borne to their last resting place, we simply fold our hands and accept it as the inevitable dispensation of an all wise Providence, who doeth all things well. The minister says, "Whom He loveth He chasteneth." Friends say the doctor has done all for them that could be done. The relatives have done all they could do, and reproach themselves no more. Now comes the "Whereas, it has pleased

Almighty God," and the chapter is ended. We have slandered and libelled the goodness and wisdom of the great Lawmaker, and veiled our faces against the sins of criminal neglect. We learn no lesson from the sad experience, and forget it as fast as possible. In fact, we act more like imbeciles than thinking, rational men and women.

Now, fellow citizens, the very best efforts of a health officer, the most carefully framed laws, the most intelligent instructions and the most skillful sanitary regulations are entirely powerless without an enlightened, energetic coöperation on the part of the people to give support to the enacted laws, and to assist in enforcing them. The people are as criminally responsible for the neglect of the proper observance of the laws as the health officer is. Our town has never paid any attention at all to sanitary work, and you say it is as healthy as any other town of its size in the State. I believe that is a fact, but it cannot long remain so without a water-supply other than our wells, without a system of sewerage that will carry away the contents of our vaults and cesspools. Rest at ease? There is danger ahead. I cannot tell how near, but it is as sure to come as we remain a village unless we "right about face." Clean up. Is not our village neat, tidy and clean? Is it? How many loads of garbage and effete matter have ever been taken outside of it? Vaults and places for deposits of slops that have never been cleansed, yet they have been used from ten to twenty years. Our village site is sand and everything is readily absorbed. Our wells, mostly drive, contain crystal pure water(?),are from six to twenty feet deep,and perhaps located within a very few yards of the water closet. In this loose, sandy soil, contamination must take place and sickness result. Our soil and subsoil are permeated with the accumulation of our existence and I believe we are already pumping from our wells, drinking, and using in our kitchens a water that would disturb a delicate stomach, if it could be seen as it is. Something must be done. Are you ready to do it?

DISCUSSION.

In the discussion of this subject statistics were brought forward showing that in the 102 outbreaks of diphtheria in Michigan during the year 1886 where isolation or disinfection was neglected there were 16.18 cases and 3.23 deaths to each outbreak, that in the 102 outbreaks where both isolation and disinfection were enforced there were only 2.86 cases and .66 deaths to the outbreak. It was also shown that where these precautionary measures were taken there was about the same proportion of saving of life in outbreaks of scarlet fever. The laws were amply sufficient now, if enforced, to save human lives. It was required by law that the health officer should be a physician. To carry out thoroughly the duties in many localities meant loss of practice. The necessity of paying health officers properly for their services was urged with much force, the present pay in most localities being declared an "attempt to get something for nothing—an offense for which individuals are sent to State prison."

Pamphlets issued by the State Board of Health on the duty of health officers in restricting communicable diseases, etc., were distributed at this time.

THE SEWERAGE OF TRAVERSE CITY: ITS NECESSITY AND PRACTICABILITY.

BY GEO. E. STEELE, C. E., OF TRAVERSE CITY.

It is hardly the fair thing to occupy the attention of a sanitary convention, held under the direction of the State Board of Health, with any lengthy papers or discussions respecting the plans which an engineer should adopt to sewer or drain Traverse City, or any other village or city, except so far as such discussions would be of value to other cities and villages in like situation, and would improve the GENERAL HEALTH. It will, therefore, be our constant aim to "delocalize" local things and make such points and observations as may be of benefit to many of the newer towns of Michigan, which are not already provided with sewers.

The general subject of sewerage is brought prominently before the public in a spasm of inquiry after the health of the particular locality, when some untoward providence has brought desolation into many happy homes. Then it is, after the horse is stolen, that the "barn is locked." The authorities get on their smellers and set to work to remedy the evil, or, in other words, to drive this dismal, dark faced something to another part of the town, by putting in a short stub of a sewer, perhaps connecting it even or below grade with a main so that it soon clogs,—perhaps making it of porous brick so that it poisons the soil for its whole length. They may practice economy by uniting a round with a square sewer, or vice versa; they may guess at the grade and make the bottom uneven, or leave the outlet to be torn out by floodwood, or to be filled up. The community then has a quiet nap, only rousing itself again when the same "circus" comes to town the second time.

Now what have the newer towns to learn from this ominous experience of the older places? Must the details be repeated with all the evils? I think it is not necessary, if the following facts are understood:

1. Towns should begin to put down sewers early. I know it will be said that there are many expenditures in keeping up schools and other public improvements, but is it not far better to promote the public health by having all excreta carried away before the soil is saturated and the ground water contaminated? This is sure to be much sooner than is generally thought. The population may not be dense nor the buildings close together. There may be only one vault so situated as to do harm, and yet that one be the means of great evil.

2. Towns should adopt a well considered plan. This is quite a difficult matter to carry out, for the reason that the authorities who have these matters in charge are changing from year to year, and often a newly elected officer seeks to pull down what his predecessor has done, whether it be good or bad. But after a topographical survey has been made, or enough elevations taken to determine the principal points of the whole town, or each of its natural divisions, and a full plan of the sewers is made, then such portion of the work can be performed as is deemed best. No money is then wasted. The lack of such plans has cost the towns of this State a very large amount. There is usually some kind of a plan, but it is not comprehensive

enough, and does not allow for population in the out-lying territory. The consequence is that much work has to be done over again. These remarks will apply as well to grades of streets and like improvements. We have just had occasion to flatten the grade of a gutter because the water main was too high, and it was thought best not to disturb it. Such is the result of "piece meal" engineering. As no plans for sewers could well be made without consulting the grade line of the streets, so this grade should be determined, even in small towns, some years in advance of necessary work, and every building should be set by some competent person with reference to this line. The irregularities in walks, crossings, entrance ways, hydrants and telegraph poles would then easily assume order out of confusion. Many little things suggest themselves right here in the scope of the general topic, but we must consider Traverse City more particularly.

Is sewering a necessity here?

The man who has no time to think about it says, "No." The man who is afraid of expense says, "No." So does the one who cannot see farther than the present; and he will be sure to add that Traverse City is famous for pure air, indeed the ozone can be taken out in chunks. If you suggest that nine physicians are located here, he will probably say they have most of their practice with country people, who dislocate their joints, or eat too many delicious cucumbers. He may claim that the invalids who come here annually to gather air furnish some of their practice also. But the man about town—that old fellow who is always meddling—will tell you that on the West side he found 200 of those *nice, ornamental, useful* things called privy vaults, made in the highest style of art, all nailed up tight so they can't leak upward, and dug down deep into the sand or water stratum, and admirably arranged so that they *can leak downward.* Not one in a hundred made with tight, cement sides and bottom, nor five in a hundred designed to be cleaned, but in process of time to be removed to a new place, and the old vault filled up and forgotten. On the East side (not counting the river front) 228 of these architectural villas grace the lawns, some of them surrounded with old ash barrels and garbage piles. On the South side there are 239 of the same sort. Altogether there are 667. Now, with a population of say 4,000, divided about as the school census runs, giving 1,150 on the West side, 1,280 on the South and 1,570 on the East, it is not far from the truth to say that Traverse City may feel indifferent now, but there will certainly be a "hereafter" unless some steps are taken to prevent this nuisance. *The soluble contents of these vaults will be carried down to the natural water stratum, in a porous soil like this, no matter how far. It will go where water goes.*

It is no reason for continuing this system that filtration will take place in our sandy and gravelly soil, and the water be made clear. Not all clear water is suitable for domestic use, and it is sometimes the most injurious.

The necessity for sewering Traverse City is not a question of present suffering as much as a preventive measure. The next generation can take care of their own sewerage, but they cannot take out of the soil the contaminations we leave in it. Hence we say that immediate steps should be taken to stop the privy vault nuisance. We should require closets to be built of cement, on the ground level, kept clean, and treated with dry earth and other deodorizers. This would be a great step in advance, if sewers were not put down immediately. It would certainly help to prove that man is as intelligent as the cat, but a look into the alleys is not favorable to such a conclusion now.

It seems to us that such a movement is needed that our town, which now has a good name for health and cleanliness, may lose none of its laurels.

Is sewering practicable in Traverse City? This will depend, among other things, on

1. The topographical features and geological formations.
2. The disposal of the rainfall.
3. The future water-supply.

A glance at the map, (printed on page 24) will show the topography as follows: Grand Traverse Bay, 30 miles long and three miles wide on the north, at the lowest level, Boardman Lake, 1½ miles long, on the south and southeast, at an elevation of about 8½ feet above the bay, and outletting over a dam toward the northwest, then turning abruptly to the east, parallel with Front street, and discharging into the bay near the foot of Wellington street. The lands south of the river in a level plateau, elevated 25 to 40 feet, extend three-quarters of a mile to hills from 100 to 200 feet high. The town is thus divided into three portions, drainable either into the bay direct, or into the river below the dam, and thence into the bay. The East side is the principal business part and may be estimated as having an area of 100 acres. The South side has an area, including Fernwood, of about 135 acres, and the West side of about 150 acres. These are estimates of the populated portions. The figures up and down through the center of the map show the elevation. The soil is a light sand with gravel underneath. There is no rock or impervious clay above the bay level.

These natural conditions must be respected in any plan for the sewering of the city, however large it may become. Some engineering plans seem rather to effect a revolution in nature, than to take up and use natural forces and topographical conditions. Leaving out of the question, for the present, the water-supply for the town, now taken out near the center of the bay 500 feet from shore, anyone would say that the sewage must go into the bay, as it is the lowest level, and for the reason that such a large body of water, being in constant motion, affords just the receptacle needed to purify sewage and carry it beyond the point where it might do harm. This is a singular property of water, and it is one from which the world derives much benefit. Says Engineer Chesbrough in his report on the sewering of New Haven: "Pure or comparatively pure water, whether salt or fresh in tidal or other streams, will render innocuous an appreciable percentage of sewage or other organic impurities." "Were this not so, many of the most populous cities and districts of the world would have long since ceased to be habitable."

If you will examine the water in a flower vase you will find it the home of a world of small things, both animal and vegetable. These facts applied to sewage removal, teach us that it must be kept constantly moving. The cause of sewer gas, more than anything else, is the sluggish current in the obstructed or flat pipes. Move it rapidly and the problem solves itself. We have no fear, then, that sewage discharged into the bay would ever do harm to those living along its shores, even if the town should become a very large city, unless it should be by use of the water. The sewers already put down have very little reference to any general plan, and are indicated on the map. A six-inch glazed pipe is laid from the Asylum, emptying into the river a little below where it first crossed Front street. A six-inch glazed tile extends from the High School building east, along the alley to Bohemia street, where

it is enlarged to nine inches, and thence extends north to the river, below Union street bridge and the dam. This is part of a system which can be used for most of the south side, even as far as Fernwood. The pipes, being laid about parallel to the surface, will have a sufficient fall. Then there is a six-inch sewer from Union street to Park Place in the alley between Front and State streets. This joins the sewer from Park Place Hotel and discharges into the river near the present depot bridge. Mr. S. Barnes also has a nine-inch sewer from his residence along the west side of Wellington street to the river, and disigned to accommodate some others who live near. From a few residences there are short sewers to the river or bay.

As the map shows, there are three districts which can not well be united into one system. The west side, being low along the bay front, could only be sewered into the river by pumping, and should be gathered into one main on Bay street, discharging into the bay near the foot of Cedar street. The south side may all be gathered into the Bohemia street sewer. The discharge into the river below the dam at any point need work no ill, as the clearing of the river of floodwood at the bridges and booms, and the flooding of it at any time by the log shute at the dam will cleanse it perfectly. The east side can be gathered into a main on Wellington street, extending from the lake to the bay, and having a fall of four inches in one hundred feet. The lake can be used to flush it daily, and no easier or more efficient plan for a main sewer need be looked for. This flushing will be accompanied by a current of air upward to the lake, the lateral and house drains to be flushed by the water-works where gravity is insufficient.

RAINFALL.

In making any plan for sewers it is necessary to decide whether the storm water shall be taken into the sewers with its accompanying silt, or whether it shall be carried off independently. In making such estimates engineers usually consult the average rainfall of the locality, and make ample provision for exigencies besides. This calculation, it seems to me, is very faulty. If the surface were as impervious as slate it would then be far from the truth, for much of the rainfall, counted by the rain gauge, is at once dissipated in humid vapor again. Then, great differences arise where the soil is hard and the rains do not sink, and where the soil is sandy and hard rains do not saturate it. It must also be considered whether much of the territory is to be paved and built with business blocks, or remains in lots and lawns. An inch of rain represents 362 barrels per acre, but, if this took one hour to fall, Traverse City would hardly know the difference. It might be thought that this rapid absorption would suddenly raise the river, but the lake and river are very constant. Experience has demonstrated that it is not economy to build large sewers to take off the rainfall with the sewage, and it is quite unnecessary to carry the rainfall in a costly pipe when it will carry itself in a street gutter to the most practicable outlet, if it has enough fall. We would not be understood as recommending such use of the gutters if the lots were all built up and the storm water excessive; but we do conclude that here the streets should be kept free from papers and rubbish, and the gutters well cleaned,—then the storm water may be carried to the river by the most practicable separate passage on each street. Much smaller sewers are put in than formerly for the same area, and, within some limits, they are more effectual

at the same grade. The excellent vitrified pipe now manufactured is contributing much to the comfort of American homes.

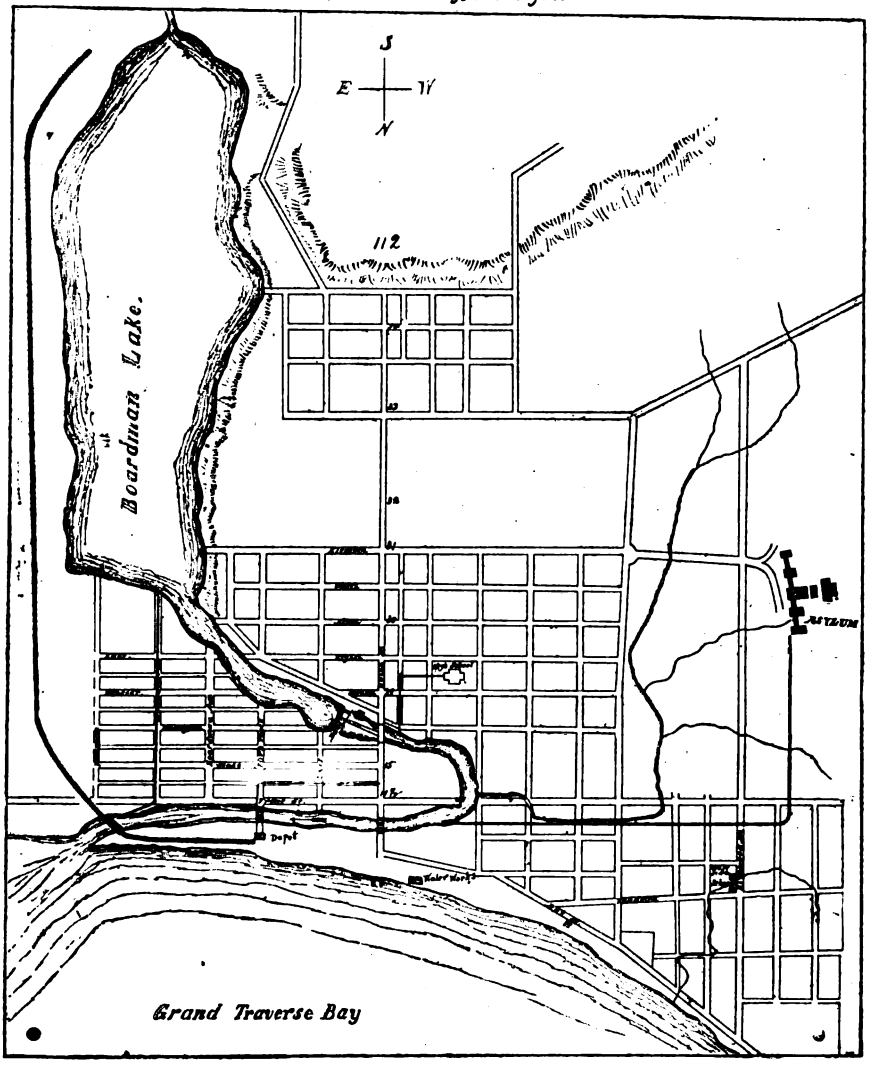
WATER-SUPPLY.

Very intimately related to our subject is the question of water-supply, and all sewerage systems should have this in view. That plan which shall pollute the waters or even render them liable to such pollution under favoring conditions of weather is susceptible of improvement. We have shown that the bay is the natural and best place to carry the sewage. Shall, then, the water-supply be taken from the bay, and as the town enlarges shall we enlarge the capacity of the water-works and increase the danger of pollution at the same time? In the light of engineering we say, no. The first impression in looking at the bay is its large extent and its purity. The supply is inexhaustible. The deep, clear water is transparent to the bottom. No one could ask more. This is its natural condition. Its artificial condition is not so. The deposit of years has covered most of the bottom with sunken edgings, saw-dust and refuse which is rolled about by the surgings of the sea. These have made great trouble in the pipes, but of late not so much, owing to some improvements at the water-works. It has been said that all the sewage carried down by the river would be carried landward by the westerly winds. This seems to be the principal current, but this is only a theory. There is no one who can say when the currents may change so as to take them to the supply main. The drainage of the west part of the town now goes into that part of the bay and will increase in amount. This is quite liable to contaminate the water. From examinations of the water within the last few weeks we have become satisfied that its quality for drinking purposes is not what the people of Traverse City should have. If any persons will persist in drinking bay water they should be allowed the privilege of putting in the trimmings to suit the individual taste. Pure water should be the cry, and an abundance of it at a moderate rate. Now is this possible beyond the influence of the sewers? It is well known that the South side wells from 18 to 26 feet deep furnish very cold, clear water usually in gravel, and of such an amount that no complaint is made of the supply. It cannot well be of better quality. This water is entirely independent of Boardman Lake and its source is in the high hills and lands south and west of the town. These springs could be utilized from at least 150 feet above the level of Front street. At the south end of Union street this water stratum has been penetrated by a pipe which has been down five years, and a few weeks ago, becoming troublesome from a fine air hole, this pipe was pulled up. We found that the screen point was covered tightly with a silicious deposit, but what was especially noticeable was the fact that this deposit was very thin on the South side from which the current of water came, and very thick on the North side from which the water retreated. Thus proving, what we had before supposed, that this water current moves toward the north. The supply is as inexhaustible as Boardman Lake for all purposes now considered. The rainfall for the eight years of which we have a record, Mr. S. E. Wait informs us, is 42 inches annually. This means 36,204 barrels on every acre draining into this source.

To furnish water for the asylum at Traverse City a large well was put down, 50 feet deep, 16 feet in diameter, and now having 18½ feet of water This is found entirely satisfactory in quality and can not be much reduced

by the powerful pump there used. To furnish the city of Kalamazoo a similar well was dug, it being 24 feet diameter and 26 feet below the first water stratum. This well can furnish 4,000,000 gallons daily and does not seem to be much drawn upon then, except that at that limit the water was not clear. The observing engineers, who had charge of this work, found that the shallow wells only took their water from the top of the ground water, which was not

Map of Traverse City, Michigan.



free from vegetable matter. To overcome this they sunk an iron caison surrounded with a heavy brick wall, so that, when down, all the water must come from the very bottom. And now Kalamazoo has plans for a second and larger well of the same kind.

Such a well, or a better one, Traverse City may have. The people of Traverse City must decide whether they will continue to draw from the bay, except for fire and irrigating purposes, whether they will try to boil the animalculæ, and, after all is said and done, *drink diluted sewage*, or whether they will go down into a water stratum which affords no possibility of furnishing both meat and drink together,—one that can not, under proper regulations, be contaminated by cesspools or sewage, and which is perfectly good and sufficient for all the future needs of the city.

Fourth Session, Thursday, August 25, at 2 P. M.

The first part of the fourth session was taken up with a discussion of the paper read in the morning by Geo. E. Steele, on the "Sewerage of Traverse City: Its Necessity and Practicability."

In opening this discussion, Dr. Henry F. Lyster, member of the State Board of Health, of Detroit, said:

A good many years after a village is organized this question is usually brought out. It should be considered earlier. The question usually settled is one that belonged to the village twenty years before. You have a good opportunity in Traverse City to keep the soil pure. The movement of the ground water underneath the city is constantly washing it out. Large sewers are not required, because the storm waters can be removed by the gutters. Small pipe sewers are sufficient because of the great fall in your village. These sewers can be built much cheaper than the old sewers which were required to carry the storm water. The storage system or system of cesspools should be abolished. In old towns where this system is in vogue the mortality from typhoid fever is very high. It is unscientific to take water out of and empty sewage into the same basin. There must be even now some contamination of the water-supply here, though not perceptible to the senses.

Dr. Lyster then considered the geology, rainfall and density of population of Traverse City and concluded that sewering was practicable.

THE DRINK PROBLEM*.

BY PROF. HENRY F. LYSTER, A. M., M. D., OF DETROIT, MEMBER OF THE STATE BOARD OF HEALTH.

Those who are looking out upon the sea of public opinion find indications of a storm in the labor question. The world will not go on contentedly with the rich becoming richer and the poor becoming poorer. It is contrary to the American idea that the workingman should be ground down between the upper and the nether mill-stones of over-supply and capital. He must work somewhere and somehow so that he can, if he has health and is industrious and frugal, acquire a comfortable home for himself and his family, permit his children to attend the public schools during school year, and lay by, in some kind of funds or property, something with

*So designated by Hon. Thos. W. Palmer, U. S. Senator from Michigan, in his Jubilee Alumni address at the University of Michigan.

which or by which to support himself and his wife when old age comes and he can no longer work. This is the American idea, and while it may be deemed utopian as applied to the whole people, yet it is the intention and aim of every man in this assembly, and if it is true in its application to us why is it not true in its application to the whole American people?

We must look about us in the larger consideration of this economical subject to find the reasons which cause so large a proportion of the community to fail as they do fail in its accomplishment. We find among others, unfortunate environment, ignorance, indolence, viciousness, dissipation, ill health. It is here that the drink problem is to be considered. And it is to be taken up not as a political or moral question, but purely from its public health aspect and in its far and wide influence upon the health of the people. This consideration of the drink problem is so great that the limits of time allotted to me in this convention will only permit me to glance at a few of its more important features.

Inheriting and adopting so largely as we have in this country the institutions and customs of Europe, we should naturally begin by studying this subject as it has existed and still exists abroad. We should first study it there and later study it here among ourselves, but the conditions of life and of government are so radically different that, while we recognize the necessity for its larger investigation, we are compelled to limit this paper to our own country. The immigrant has landed upon our shores, and while he has brought over with him the habits of his own class and of his own people, and may be ignorant and unenlightened, he is on the average a better man than those of his own station whom he has left behind. He has come in obedience to his star of destiny, which, like the cloud by day and the pillar of fire by night, led up the children of bondage three thousand years ago from out the land of the oppressor. There is the germ of something better within him which is seeking development under a more favorable environment than that which he left behind him. There is something which is instinctively searching for the improvement of the man. He is seeking for a congenial atmosphere where he may grow mentally and physically until he attain the full stature of his being. He is ignorant, but he has been drawn to us by the magnet of free education. He is oppressed, but he has been drawn to us by the magnet of personal liberty. He has the inherited vices of generations of over-government, but he has left the crushing hand of power and he has come to govern himself. We must accept him as he comes and we must incorporate him into our cis-Atlantic institutions. We must not allow him to Teutonise or Celticise us, but we must assimilate and Americanize him. This we can not do in a day, but we can do a good deal in a generation. So large has been the immigration and so inferior has been the quality of the immigrants, that the average moral and educational status of large areas of this country is lower to-day than it was fifty years ago. Certainly is this the case in New England, and presumably it is so in other sections of the Atlantic seaboard, but the genius of the people has not been changed and the educational plane and the personal environment will constantly and steadily improve over the whole area of the continent.

The life of the immigrant is not the best life in point of natural expectancy, as it is called, or its longevity. It does not compare favorably with that of persons whose ancestors have been in this country for several generations. The longest lived among us are to be found in the oldest settled

portions of the country, and not in the newly-settled or among the new comers. This is due largely to the want of acclimatization, in its larger sense, as well as to the hardships, poverty and bad habits of living among those who are being transplanted to the new world.

It may safely, I think, be assumed that the consumption of alcoholic liquors decreases in proportion to the length of residence in this country; that the native Americans consume less than do those of foreign birth. Now if these premises are correct it will indicate that, with the gradual restriction of immigration toward which the country is now tending, the relative consumption of alcoholic liquors will in time diminish.

We may enquire here, "What are the more important factors that are producing this change?" They are moral, political and educational. The two former we will not discuss, but the latter belongs to the public health consideration of the subject. The people are being generally yet surely educated regarding the effects of alcohol upon the system. This instruction has become incorporated into our public school system for instruction of the youth. It permeates the legislative enactments for the limitation of its sale and use. It permeates our whole system of life and accident insurance so largely extended among all classes of our people.

There is coming the steady, yet sure, dethronement of alcholic liquors from their place in the practice of medicine, as reliable agents in the cure of disease and in the prolongation of life, except in a very restricted sense and under limited conditions. Physiology, or the study of the functions of the several organs of the body, and histology, or the study of the intimate structure of the organs themselves, show that alcoholic liquors lessen the activity of the vital phenomena or the molecular change. On this account some have been led to believe that they were conservators of force, or a savings bank, as some writer has called them, or, according to another writer in the July number of the North American Review, paratriptics, or preventers of waste, and he ingeniously recommends them to sedentary persons, engaged in intellectual pursuits, as conservators of nerve force. It is for this very reason, chiefly, that they are unscientific in their application. We do not desire that this tissue change and molecular disintegration should be retarded. The complete cessation of it means death, and its diminution means the retention of used material in the tissues, and later in the blood, and an interference with the proper elimination of effete matter from the system. With this condition of affairs comes in a train of diseased conditions, noticeably dyspepsia, neuralgias, rheumatisms, gout, carcinoma (cancer), tuberculosis, consumption, cerebral degeneration, mental enfeeblement, insanity, apoplexy, skin diseases, Bright's disease among the more chronic, and erysipelas, pneumonias, and fevers of various kinds, among the more acute. These diseases can, any or all of them, arise in other conditions, and do occur among persons wholly free from personal or inherited alcoholic taint, but they are, other things being equal, proportionally less frequent among such persons. There is nothing, for instance, that will produce premature old age with such certainty as the alcoholic habit. The mental and physical conditions which, we may say, belong naturally to very advanced years, when cell atrophy exists, and fatty degenerations are natural, and where the mind partakes in the general debility of the nervous and muscular system, are not infrequently found in the habitual consumer of alcoholic liquors who has not reached forty years. Shakespeare, with that wonderful observation that can alone

account for his preëminence, says through one of his old men, Adam, in "As You Like It," Act II, Scene III:

"Though I look old, yet I am strong and lusty;
For in my youth I never did apply
Hot and rebellious liquors in my blood,
Nor did not with unbashful forehead woo
The means of weakness and debility;
Therefore my age is as a lusty winter,
Frosty, but kindly: let me go with you;
I'll do the service of a younger man
In all your business and necessities."

How often is it the case that physicians are called upon to cure those who are suffering from some of the chronic entailments of alcohol where it is utterly impossible for them to be of service. It may be that a generation or two have intervened between the cause and the effect. I know of a case where a gentleman, who is and always has been a total abstainer from stimulants, is a victim of the gout, hopelessly an invalid; too much grandfather was his trouble. All the shades of physical, mental and moral obliquity from the correct standard may be traced to this cause—the alcoholic habit.

It would not be fair or truthful to lay all our ills to this origin, but when one speculates upon the causes that keep back the human mind from reaching the perfection which it should have attained there will be no one factor so important as the one we are engaged in considering.

Regarding its effect upon longevity the physiological action mentioned has been generally conceded. It is true that in a list of centenarians, whose deaths have been recently tabulated in the British Medical Journal, a number had been accustomed to a night-cap of wine or gin for many a long year, but if my recollection serves me correctly a majority even of these had not used liquors, and most of them were women. This fact then, in our general education, has been conceded, that the daily use of even a moderate amount of alcoholic liquors diminishes longevity, and this fact is becoming very generally known among the people.

Now with reference to their effects upon the digestive functions, the people are beginning to learn the fact and to believe in its reliability, that alcoholic liquors diminish the digestive ability of the stomach, and are very largely the cause of dyspepsia in a majority of those who use them. It is within the observation of those who keep their eyes open that the only steady drinker who can live on year after year is the one who is a good eater and a large eater. Those who lose their appetites and whose stomachs become unreliable and who complain of dyspepsia have their days but a span long and soon disappear. The stomach as a rule is one of the first of the vital organs to suffer from the alcoholic habit. The liver suffers secondarily from passive congestion and later from contraction, and, when affected, it too aids in deranging the stomach by retarding the portal circulation.

The stomach of the chronic drinker is very greatly changed from its normal condition. It is thickened and congested, and its digestive function is very seriously impaired. Digestion is in itself never improved by alcoholic liquors. When stimulants have been advised as aids to digestion, their function has been rather to stimulate the nerves of the stomach before food

has been given, and to promote the appetite or desire for food. If these are facts as I believe, then are alcoholic liquors largely responsible for the impaired digestion and for the dyspepsia that impairs the health of those who use them. Not a few persons have been compelled to change entirely their habits of life on this account, and have had their opinions of alcoholic beverages altered, not from any new moral view, but from the physical necessity which impelled it. The strength of the consumer of alcoholic beverages is diminished below that of the non-consumer, and he is consequently less able to bear continued labor and becomes earlier fatigued than the abstainer. This is true of mental as well as physical exercise, and applies to the brain worker as well as to the hand worker or mechanic. Neither can accomplish so much with the addition of alcoholic liqurs to their diet as they can without its use.

It is as generally a conceded fact that neither extreme of temperature can be borne so well by consumers of alcoholic beverages even in limited quantity as by those who are not addicted to their use. In conformity with this view the most stringent rules and regulations have been framed looking to the entire abolition of alcoholic liquors among those called upon to endure hardships or prolonged strain, lasting for weeks or months, or contests in athletic sports.

If these are facts. do they not have some significance in the labor questions of the day, and do they not deserve to be considered when summing up the causes of the failure of so many to live up to the American idea of self-support?

The entailments of alcohol have long since received consideration at abler hands than mine in this board of health. They are legion. Among them are to be found mental and moral depravity, imbecility, idiocy, insanity, viciousness of disposition, morbid eccentricity, pyromania, kleptomania, homicidal and suicidal tendency, struma, enfeebled constitutions, consumption—"that white plague of the north," as Dr. Oliver Wendell Holmes has designated it so truly, that heads the list of all our mortality. Dipsomania or the mania for drink is transmitted as one of the entailments which tends to fasten the appetite upon the children of those who have been addicted to its use.

For those who have not had their attention called to the statistics of the drink problem and who may on this account have been led to underrate the size and power of the octopos which holds so many in its embrace and threatens all of us by its power and vengeance, I will conclude this paper with extracts from official reports issued the present year by the government of the United States. When we have these facts and recollect that in the first one hundred years of this country's history we had gained only 2½ per cent over the consumption,—that is, that all our improvements and personal property would not pay the expenses of the people more than 2½ years, we believe that we can find involved in the drink problem many of the causes which disturb the industry and the advancement of the country.

NO. 32.—AMOUNT OF PRODUCTION *in the United States of* FERMENTED LIQUORS *and* DISTILLED SPIRITS, *together with the* QUANTITY *of* DISTILLED SPIRITS *withdrawn for* CONSUMPTION, *from 1863 to 1886, inclusive.*

Year ending June 30.	Production of fermented liquors.	Production of distilled spirits, exclusive of brandy distilled from fruit.									Production of fruit brandy.	Total production of distilled spirits.	Distilled spirits other than fruit brandy withdrawn.
		Bourbon whisky.	Rye whisky.	Alcohol.	Rum.	Gin.	High wines.	Pure, neutral, or cologne spirits.	Miscellaneous.	Total.			
	Barrels. [a]	Tax. galls.	Tax. galls.	Tax. galls.	Tax. galls.	Tax. galls.	Tax. galls.	Tax. galls.	Tax. galls.	Tax. galls.	Tax. galls.	Tax. galls.	Tax. galls.
1863	2,006,625											[b]16,149,954	[c]16,149,954
1864	3,141,381											[b]85,295,393	[c]85,295,393
1865	3,657,181									16,936,778	37,196	16,973,974	16,936,778
1866	5,115,140									23,814,051	248,654	24,062,705	14,599,289
1867	6,207,402									32,299,629	440,607	32,740,236	14,148,132
1868	6,146,663									16,395,651	515,262	16,910,913	6,709,546
1869	6,342,055									53,367,884	908,858	54,276,742	61,183,559
1870	6,574,617									71,337,099	1,223,830	72,560,929	77,266,368
1871	7,740,260									54,576,446	2,472,011	57,048,457	59,842,617
1872	8,659,427									68,275,745	1,089,698	69,365,443	65,145,880
1873	9,633,323									68,236,567	2,965,987	71,202,554	62,945,154
1874	9,600,897									68,805,374	766,687	69,572,061	61,814,875
1875	9,452,697									60,930,425	1,757,202	62,687,627	62,668,709
1876	9,902,352									57,959,647	672,221	58,631,868	57,340,472
1877	9,810,060									59,912,268	1,527,141	61,439,409	57,016,248
1878	10,241,471	6,405,520	2,834,119	10,277,725	1,603,378	364,963	19,412,985	11,108,023	4,096,342	56,103,053	1,239,403	57,342,456	49,600,828
1879	11,106,094	8,587,081	4,001,048	19,594,283	2,243,455	372,777	18,033,352	13,459,486	5,000,840	71,392,621	995,752	72,388,373	52,008,487
1880	13,347,111	15,414,148	6,341,991	21,631,009	2,439,301	394,668	15,210,389	20,657,975	8,265,789	90,355,270	1,023,147	91,378,417	61,126,634
1881	14,311,028	33,632,615	9,931,609	22,988,960	2,118,506	549,596	14,363,581	23,556,608	10,586,666	117,728,150	1,799,861	119,528,011	67,426,000
1882	16,952,085	29,575,067	9,224,777	15,201,671	1,704,084	569,134	10,962,879	27,871,293	10,744,156	105,853,161	1,430,051	107,283,212	70,759,548
1883	17,757,892	8,662,245	4,784,654	10,718,706	1,801,960	545,768	8,701,951	28,296,253	10,502,771	74,013,308	1,281,202	75,294,510	75,508,785
1884	18,998,619	8,896,832	5,089,958	12,385,229	1,711,158	641,724	6,745,688	28,538,680	11,426,470	75,435,739	1,095,428	76,531,167	78,479,845
1885	19,185,953	12,277,750	5,328,043	13,436,916	2,081,165	639,461	3,235,889	27,104,382	10,811,757	74,915,363	1,489,711	76,405,074	67,689,250
1886	20,710,933	19,318,819	7,842,540	11,247,877	1,799,952	656,607	2,396,248	26,538,581	10,543,756	80,344,380	1,804,880	81,849,260	69,295,361

[a] Of not more than 31 gallons. [b] The returns of spirits distilled from apples, grapes, and peaches were included in the account of spirits distilled from other materials until July 1, 1864. [c] Including fruit brandy. No returns of the production of the different kinds of spirits other than fruit brandy were made prior to July 1, 1877. There are no official data of annual production of spirits prior to 1866, except quantities on which tax was paid. There are provisions for exportation of spirits without payment of tax in acts of July 1, 1862, and June 30, 1864; also provisions for abatement of tax on spirits lost by leakage in transportation in acts of March 3, 1863, and June 30, 1864, but there are no data in office of the Commissioner of Internal Revenue by which the total quantity of spirits so exported and lost by leakage each year can be determined prior to fiscal year 1866-'67. Hence the production above given for 1863, 1864, and 1865 is the same as the tax-paid quantities for those years, and represents the true production less unknown quantities exported and lost by leakage. To get production for 1866, the quantity returned for tax that year (14,847,943 gallons) is added to 9,214,762 gallons stock on hand at close of same year (see page ix., Rep. Com. Int. Rev., 1867), making 24,062,705 gallons as production of 1865-'66, though some of the quantity in warehouse at close of the year may have been, and doubtless was, produced in previous years.

NO. 38.—*Annual* CONSUMPTION *of* DISTILLED *and* MALT LIQUORS *and* WINES *in the United States and the* AVERAGE *annual* CONSUMPTION *per capita of* POPULATION *during the Years 1840, 1850, 1860, and from 1870 to 1886, inclusive.*

Year ending June 30.	Distilled spirits consumed.				Wines consumed.			Malt liquors consumed.			Total consumption of wines and liquors.	Total consumption per capita of population.			
	Spirits of domestic product.		Imported spirits entered for consumption.	Total.	Wines of domestic product. [a]	Imported wines entered for consumption.	Total.	Malt liquors of domestic product. [a]	Imported malt liquors entered for consumption.	Total.		Distilled spirits.	Wines.	Malt liquors.	All wines and liquors.
	From fruit.	All other.													
	Pr. galls.	Pr. galls.	Pr. galls.	Pr. galls.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Pr. galls.	Gallons.	Gallons.	Gallons.
1840	(b)	40,378,090	2,682,794	43,060,884	124,734	4,748,362	4,873,096	23,162,571	148,272	23,310,843	71,244,817	2.52	0.29	1.36	4.17
1850	(b)	46,768,083	5,065,390	51,833,473	221,249	6,094,622	6,315,871	36,361,708	201,301	36,563,009	94,712,355	2.23	0.27	1.58	4 08
1860	(b)	83,904,258	6,064,393	89,968,651	1,860,008	9,199,133	11,059,141	100,225,879	1,120,790	101,346,699	202,374,461	2.86	0.35	3.22	6.43
1870	1,223,830	77,266,368	1,405,510	79,895,708	3,059,518	9,165,549	12,225,067	203,743,401	1,012,755	204,756,156	296,876,931	2.07	0.32	5.30	7.69
1871	2,472,011	59,842,617	1,745,033	64,059,661	4,980,783	10,853,280	15,834,063	239,838,137	1,299,990	241,138,127	321,031,851	1.62	0.40	6.09	8.11
1872	1,089,698	65,145,880	2,186,702	68,422,280	6,968,737	9,713,300	16,682,037	288,357,983	1,940,933	270,298,916	355,403,233	1.68	0.41	6.65	8.74
1873	2,965,987	62,945,154	2,125,998	68,037,139	8,953,285	9,893,746	18,847,031	298,519,675	2,177,587	300,697,262	387,581,432	1.63	0.45	7.27	9.29
1874	766,687	61,814,875	1,958,528	64,540,090	10,951,859	9,516,855	20,468,714	297,519,981	2,001,084	299,521,065	384,529,869	1.51	0.48	6.99	8.98
1875	1,757,202	62,668,709	1,694,647	66,120,558	12,954,961	7,036,369	19,991,330	292,961,047	1,992,110	294,953,157	381,065,045	1.50	0.45	6.71	8.66
1876	672,221	57,340,472	1,471,197	59,483,890	14,968,085	5,193,723	20,161,808	306,852,467	1,483,920	308,336,387	387,982,085	1.32	0.45	6.83	8.60
1877	1,527,141	57,016,248	1,376,729	59,920,118	16,942,592	4,933,738	21,876,330	303,854,988	1,072,679	304,926,667	386,723,115	1.29	0.47	6.58	8.34
1878	1,103,351	49,600,838	1,227,752	51,931,941	17,953,386	4,310,563	22,263,949	317,136,597	832,755	317,969,352	392,165,242	1.09	0.47	6.68	8.24
1879	1,021,708	52,003,467	1,253,300	54,278,475	19,845,113	4,532,017	24,377,130	343,724,971	880,514	344,605,485	423,261,090	1.11	0.50	7.05	8.66
1880	1,005,781	61,126,634	1,394,279	63,526,694	23,298,940	5,030,601	28,329,541	413,208,885	1,011,280	414,220,165	506,076,400	1.26	0.56	8.26	10.08
1881	1,701,206	67,426,000	1,479,875	70,607,081	18,931,819	5,231,106	24,162,925	442,947,664	1,164,505	444,112,169	538,882,175	1.37	0.47	8.63	10.47
1882	1,216,850	70,759,548	1,580,578	73,556,976	19,934,856	5,628,071	25,562,927	524,843,379	1,536,601	526,379,980	625,499,883	1.39	0.48	9.97	11.84
1883	1,253,278	75,508,785	1,690,624	78,452,687	17,406,028	8,372,152	25,778,180	549,616,338	1,881,002	551,497,340	655,728,207	1.45	0.48	10.18	12.11
1884	1,137,056	78,479,845	1,511,680	81,128,581	17,402,938	3,105,407	20,508,345	588,005,609	2,010,908	590,016,517	691,653,443	1.46	0.37	10.62	12.45
1885	1,468,775	67,689,250	1,442,067	70,600,092	17,404,698	4,495,759	21,900,457	594,063,095	2,068,771	596,131,866	688,632,415	1.24	0.38	10.44	12.06
1886	1,555,994	69,295,361	1,410,259	72,261,614	17,366,393	4,700,827	22,067,220	640,746,288	2,221,432	642,967,720	737,296,554	1.24	0.38	11.18	12.62

[a] Product less exports.

[b] Included with "All other."

NOTES.—(1) The data as to product of domestic liquors and wines for 1840, 1850, and 1860 were derived from the Census. (2) The consumption of imported liquors and wines for 1840, 1850, and 1860 is represented by the net imports. (3) The production of domestic wines, from 1870 to 1885, has been estimated by the Department of Agriculture; by Mr. Charles McK. Leoser, president of Wine and Spirit Traders' Society, New York, and other well-informed persons, and the amount stated as consumed represents the production minus the exports. (4) The consumption of domestic spirituous and malt liquors, from 1870 to 1886, was obtained from the reports of the Commissioner of Internal Revenue. (5) In computing the quantity of sparkling and still wines and vermuth in bottles, 5 so-called quart bottles are reckoned as equivalent to the gallon. (6) The consumption of distilled spirits as a beverage is estimated to be about 90 per cent. of the product consumed for all purposes. See letter of Mr. James A. Webb, of New York, page 398.

SUMMARY.

Kinds of liquors.	Quantity, gallons.	Estimated cost.	
		Per gallon.	Total.
Spirits	75,000,000	$4 50	$337,500,000
Beer	609,705,367	50	304,852,683
Imported wines	4,100,664	4 00	16,402,656
Domestic wines	17,391,343	2 00	34,782,686
Total annual cost to consumers of alcoholic beverages in the United States, for three years ending June 30, 1886			693,538,025
Add for illicit whisky and home-made wines			6,461,975
			$700,000,000

Are the above figures correct? The best proof will be to take the last yearly statement of the Bureau in detail:

	Gallons.	Gallons.
Domestic spirits consumed		70,851,355
Less alcohol used in arts	8,861,247	
Less spirits used to adulterate imported brandy	455,231	
		9,316,478
Used as a beverage		61,534,877
Water added estimated at 15 per cent		9,298,515
Imported spirits (less brandy and alcohol)		954,195
Total spirits consumed		71,787,587

ESTIMATED COST.

Domestic distilled spirits, 71,787,587 gallons, sixty drinks per gallon, at 7½ cents per drink, or $4.50 per gallon	$323,044,141
Domestic beer, 640,746,288 gallons, at 50 cents	320,373,144
Imported beer, 2,221,432 gallons, at $1	2,221,432
Domestic wines, 17,366,334 gallons, at $2	34,732,786
Imported champagne, 547,678 gallons or 2,738,390 quart-bottles, at $2.50	6,845,975
Imported still wines, 4,096,090 gallons, at $4	16,384,360
Imported vermuth, 57,059 gallons, at $6	342,354
Imported brandy, 455,231 gallons; domestic spirits, used in adulteration, 455,231 gallons; total 910,462 gallons, at $8	7,283,696
Total	$711,227,888

ESTIMATED NUMBER OF PERSONS CONSUMING SPIRITUOUS LIQUORS AND PER CAPITA CONSUMPTION AND COST.

What is the number of persons consuming annually 75,000,000 gallons of spirits, 609,705,367 gallons of beer, 21,492,007 gallons of wine, and what is the per capita consumption and cost?

Taking the census of 1880 we find that out of a total population of 50,155,783 there were 16,966,035 under twelve years of age, representing 34 per cent. of the total population. Those between twelve and fifteen represent 6 per cent of the total. Assuming that the same ratio now exists, we estimate as follows:

Total population in 1886	58,600,000
Less children under twelve	19,924,000
Total over twelve	38,676,000
Less youths between twelve and fifteen, excluding 5 per cent. of the male youths as users of liquor	3,428,100
	35,247,900
In 1880 the female population represented 49.1 per cent. of the total. Upon that basis there were, in 1886, above the age of fifteen, 17,306,719 women. Those of foreign birth number 2,120,073, of whom it is estimated that 90 per cent. consume liquor in one form or another. Of the native women it is estimated that one in ten uses alcoholic beverages. This leaves the number of women to be deducted as non-consumers of spirits, wine or beer	15,080,318
	20,167,582
The male population over fifteen in 1886 (using the census figures of 1880 as a basis) numbered 17,941,181, of whom 3,027,481 were under twenty-one years of age. Deduct as non-consumers one-half the number of males between fifteen and twenty-one, and one-fourth over twenty	5,242,165
Leaving a liquor-consuming population of	14,925,417

The drinking population therefore represents 25½ per cent. of the total population, and is centered in the cities which contain 22½ per cent. of the total population. On that basis, taking the estimates of Prof E. B. Elliott, actuary of the Treasury Department as to the total population, except for 1886, we have the following:

Year.	Total population.	Drinking population.
1882	52,799,000	13,463,745
1883	54,163,000	13,811,565
1884	55,554,000	14,166,270
1885	57,093,000	14,558,715
1886	58,600,000	14,925,417

Taking the average annual consumption for five years at 75,199,900 gallons of whisky, 581,398,685 gallons of beer, 23,163,425 gallons of wine, at a total cost of $700,000,000, we have the following per capita consumption and cost for an average population of 14,185,142: 5.3 gallons of whisky, 40.9 gallons of beer, 1.6 gallons of wine, at a cost of $49.34.

The following table exhibits the per capita consumption based on total population, drinking population, and yearly cost per capita to consumers, taking annual consumption as reported by the Bureau of Statistics:

Per capita consumption.

Year.	Spirits.		Beer.		Wine.		Cost yearly to consumers.
	Total population.	Drinking population.	Total population.	Drinking population.	Total population.	Drinking population.	
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	
1882	1.3	5.4	9.8	39.1	.48	1.9	$47 65
1883	1.4	5.7	10.2	39.9	.47	1.8	49 20
1884	1.4	5.7	10.6	41.6	.36	1.4	49 25
1885	1.2	4.8	10.4	40.9	.38	1.5	45 05
1886	1.2	4.8	10.9	43.0	.37	1.4	45 90
Average	1.3	5.3	10.4	40.9	.41	1.6	47 41

No. 49.—COMPARATIVE SUMMARY *of the* CONSUMPTION PER CAPITA *of* POPULATION *in the United States, the United Kingdom, France, and Germany of* DISTILLED SPIRITS, WINES, *and* MALT LIQUORS *during each Year from 1881 to 1885, inclusive.*

[From original official data.]

Years.	Distilled spirits.				Wines.				Malt liquors.			
	United States.	United Kingdom.	France.	Germany.	United States.	United Kingdom.	France.	Germany.	United States.	United Kingdom.	France.	Germany.
	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.
1881	1.39	1.00	.94	1.32	.48	.43	18.52	(a)	9.97	33.90	(a)	22.35
1882	1.45	1.07	1.08	1.14	.48	.41	27.10	(a)	10.18	33.75	(a)	22.45
1883	1.46	1.08	1.24	1.19	.37	.40	30.75	(a)	10.62	33.13	(a)	22.45
1884	1.24	1.05	1.25	1.11	.38	.39	30.67	(a)	10.44	33.72	(a)	23.19
1885	1.24	1.01	1.33	1.14	.38	.37	26.88	(a)	11.18	32.79	(a)	23.78

[a] No data.

NOTE.—The years referred to are, for France and Great Britain calendar years; for the United States the five years ending June 30, 1886; for Germany in the case of beer, the five years ending March 31, 1885, and in the case of spirits the five years ending March 31, 1881, these being the latest years for which data were obtainable.

FOODS AND THEIR ADULTERATIONS.

BY S. BARNES, OF TRAVERSE CITY.

When I was asked my opinion relative to the holding of the State Sanitary Convention at this place I said that I questioned the feasibility of so doing for several reasons adduced at the time. Later on, when I learned of the proposal of the Business Men's Association to proffer an invitation to the State Board of Health I thought it questionable if it would be done. Imagine my surprise on being confronted with an official request from the committee of arrangements to prepare and read a paper on "Foods and their Adulterations." I have reluctantly consented to read such portions of a commercial paper, which I prepared to read before the meeting of the Business Men's Association of Michigan, as to me seemed pertinent to this occasion, as the only thing I had time to do, to evince my willingness to endorse the principles advocated by this body for the preservation of health. In doing this I shall not satisfy myself, and I fear shall not meet the hopes of my listeners.

Such as it is, it is submitted to your kind criticism, gentlemen, as the crystalized conviction of not a day or a year, but as the mature conclusion of years. Let me bespeak for it the consideration which the writer would willingly accord to any one of you, were you placed in his position.

It has been truly said of the dealers in food products, of which I am one, that "We are the ones who feed and nurture the community." If so, shall we not see to it that we furnish pure nutriment? When statistics go to show that the average cost of food for individuals in the United States is about $1.60 per week, there seems no good reason why any human being should use other than pure food. Added to the cheapness of food is the fact that no other nation in the world produces such a variety from which to select. What applies to human beings necessarily should apply to animals which depend upon their owners for sustenance. Theoretical statisticians, who can obtain information from only very limited sources as compared with a dealer, state that adulteration as applied to staples is about as follows:

Spices in their various forms	66 per cent.
Ground coffees	45 "
Teas	48 "
Low grades of sugar (high grades rarely adulterated)	20 "
Syrup	50 "
Milk (when not inspected)	50 "
Cream of tartar	44 "
Baking powder, about	44 "
Bread	2 "

It is fair to conclude that the live grocer of to-day, who possesses much greater facilities for ascertaining facts, in a general way, than any theoretical professor who must base his information upon a small line of samples submitted to him for analysis, ought to know things from a practical standpoint.

When the manufactory is visited and one is let in behind the scenes, which can only be done by special permission, and one sees the number of things

which, it is openly claimed, are used for the purpose of lowering the price of many different articles which come into daily use in every family in the United States, such information must overtop the theoretical report of the professional chemist, who could, under no circumstances, obtain admission to such establishments. When one is shown tons of buckwheat bran, dozens of tons of terra alba, or white clay, tierces of alum, barrels of turmeric for coloring, carloads of rejected and musty flour, loads of middlings, sacks of almond shucks, tons of inferior corn meal, piles of chicory and carloads of starch, one is strongly impressed with the idea that white clay is not the most digestible compound, that alum and turmeric are not particularly nutritious and that rejected flour, when used for food, is not likely to produce longevity. We are none the less impressed with the inherent wrong of using the articles named above, for the purpose of cheapening these products, which are claimed to be one thing, while one-half or two-thirds of them are nothing better than bran, middlings, clay or vegetable coloring matter. When one looks at the price-list in which rice hulls, oat hulls and such valueless truck are quoted and understands that hundreds of carloads are used by metropolitan makers who grind feed, for the purpose of cheapening their product, and comprehends the villainy of using such articles, which are merely woody fiber and cannot be taken into the stomach of an animal without causing suffering, producing sickness and, in many cases, death, we begin to have a little idea of what adulterated food means. There are those who think it not improbable that, in some cases, maple sawdust is used for this same purpose.

Notwithstanding such an array as the above, it is no doubt true that it is beyond question that there are manufacturers who put up just what they claim to do. The high-minded merchant of to-day not only *should* but *does* persist in selling goods on their merits, calling things by their right names and giving the weight and measure for which he is paid. The unscrupulous dealer argues that if he can make more money by selling dishonest goods, he can afford to pocket his integrity with his money.

Would it not be wise to educate the business man of to-day to understand that it is not only discreditable to business to sell articles of little worth for the genuine, but that he should sell just as many pounds or gallons as he *pretends* to and as the consumer is made to *pay for* and that he should sell just what he claims to, so far as quality is concerned, representing in the sale whether the article sold is pure or mixed with other material for the purpose of lowering the price? Should the consumer not be taught that he who offers ground goods for a less price than the unground goods are worth must be perpetrating a fraud, and that, if he offers a prize with his goods, he is probably selling inferior goods as compared with the honorable competitor who offers no prizes? If this were done, would not healthy public sentiment be strong enough to aid in abolishing the system? Let the dealer get upon a healthy plane so far as handling adulterated food is concerned, and he will necessarily purchase goods only of jobbing houses whose integrity for handling honest goods is beyond question.

Should Congress not be as ready to pass a national law, compelling all manufacturers to state whether their goods offered for sale are pure or adulterated, and, if adulterated, to state what per cent of adulteration and the material used therein, to have their trade marks bear the facts on their labels or bills of sale, and compel the jobber and retailer to do the same,

whether it be food or drink for man or animal, as it has recently been in passing the Oleomargarine Bill for that purpose?

In this connection, it seems to me pertinent to urge upon all human beings the imperative importance of knowing that the water they drink is *pure*, beyond question, and free from "septic poison," which is swept into the ground by the rainfall, which acts as a scavenger on all surface filth contained in cess-pools, barn yards, swill holes and dirty back yards and alleys. The numberless deaths caused by this insidious poison cannot be laid at the door of adulterated food, but are the result of criminal neglect and carelessness on the one hand or want of intelligence on the other.

Judge Finletter, of Philadelphia, in rendering a recent decision, says, practically, this:—Anything that cheapens food is a blessing, but it is not a blessing for a man to buy an article manufactured out of something else than what it is represented as being manufactured from. Which, put into plain Anglo-Saxon, is this: That, when a man buys pepper, he should not pay for buckwheat bran; if he buys mustard, he should not pay for white clay or corn-meal; if cinnamon, he should not pay for almond shucks; if ginger, he should not pay for damaged flour; if baking powder, he should not pay for alum; if tomatoes, he should not pay for river water; if coffee, he should not pay for rejected beans or wormy peas; if sugar syrup, he should not pay for glucose made from corn combined with sulphuric acid; if tea, he should not pay for some kind of leaf treated with prussic acid. In other words, a man should *pay for what he gets*, and get *just exactly for what he pays for*. Some years since, an opportunity offered itself by which I was permitted to see the inner workings of a ground-goods manufactory in one of the principal metropolitan centers of the states. Being invited to enter the "inner temple" of the concern, the proprietor made a voluntary exhibit of original orders given by some of the largest jobbers in the country, east, west, north and south, covering the commercial centers from the Pacific to the Atlantic. My attention was called to the details of many of those orders, a single sample of which might be of interest; by way of illustration, 500 boxes of ground pepper assorted as follows:

50	boxes	with	30	per cent	adulteration.
50	"	"	50	"	"
100	"	"	60	"	"
100	"	"	75	"	"
100	"	"	80	"	"
100	"	"	90	"	"

Corresponding orders for others ground goods would run from 20 to 80 per cent adulteration, all put up in different colored labels, with *one* noticeable feature, viz: the greater the adulteration the stronger were the marks which indicated purity, such as 80 per cent adulteration branded "XXX pure," or 60 per cent adulteration branded "strictly pure," evidently showing the intention on the part of the jobber to entirely misrepresent the quality to the consumer and, in too many cases, to mislead the retailer who was not "well up" in the business.

This abuse will steadily increase as the years go on, unless it is nipped in the bud by a law as widespread as the Union and as omnipotent as Congress can make it. The American people of to-day are good imitators, and if money can be made by fraud in one direction, it will stimulate the unprincipled man to find some other means by which he can climb up the ladder of fortune.

With the very great step that Congress has just taken in passing the Interstate Commerce Law, there would seem to be well-grounded hope for the success of the popular demand by the successful, thoughtful, high-minded business men of every business community, that this villainous habit of adulterating food products in any and every form must be legislated upon by the lawmakers at Washington, and the practice once and forever prohibited under extreme penalties of the law. Submitted—That it is just as wrong for the state or nation to be a party to educate its citizens to dishonesty as it is for a private citizen to educate his family or employes to steal. If we neglect to keep people honest by not throwing about them such guards as seem necessary, are we not just as much to blame as if we educate them to be thieves? The business men of the entire nation are the only ones who are competent to understand or remedy the growing evil.

As "health" is the only under-lying stratum of "happiness" and as, without both, life is hardly worth the living, it is sincerely to be hoped that this convention, and its like the country over, may by its thoughtful deliberations prove an incentive to impel prompt and united action, in the way of devising the best methods for an early removal of these abuses and the education of the masses, who in no way comprehend the enormity of these abuses, nor the terrible effect as shown in the death-rate of the nation.

S. D. Hutchinson, M. D., of Northport then read a paper on "School Hygiene," for which, on motion of Dr. Vaughan, he was tendered a vote of thanks.

Fifth Session—Thursday, August 25, At 8 P. M.

The fifth session was called to order by the President, and listened to music by Prof. Scamnel. After prayer by Rev. Geo. H. Cate, Dr. DeCow gave a cornet solo. J. K. Elms, M. D., of Traverse City, then discussed the subject of School Hygiene.

Thos. T. Bates, of Traverse City, then read the following paper entitled "The Money Value of Sanitary Work":—

THE MONEY VALUE OF SANITARY WORK.

BY THOS. T. BATES OF TRAVERSE CITY.

The times in which we live are deemed very practical; and yet, in fact, they are preeminently theoretical. It is an age of experiment, of research, of investigation. These produce conjecture, assumption, theory. Theory is set opposite practice. The one is not necessarily antagonistic to the other. Practice does not oppose theory, but rather supplements it. Theory is a basis of practice. Failure in practice does not always pre-suppose faulty theory. The abstract principle may be right, the application wrong.

This paper is not intended as a discussion of the theory of sanitation in the abstract, but rather its practical application to the everyday life we live; not to note the rapid advancement of sanitary ideas and the high hopes entertained of influence in the near future upon the health and morals of the nation, but rather to consider it as we find it to-day. To successfully accomplish sanitary reform, the general public must be made interested in the work. It cannot be confined to a few enthusiasts in a state or a county. It must be made a city and a neighborhood matter. Talk will interest but not accomplish. Pure air, pure water, pure food are all necessary to this end. These

cannot be had without cost. The merchant, the mechanic, the banker, the laborer, the tax-payer generally must be shown that there is a money value in sanitary work. The first question asked is, "Will it pay?" It will not do to reply that health pays better than sickness, life better than death. This is readily admitted. But your interrogator turns with the question, "Does sanitary work insure health,—lengthen life?" In other words, will the investment pay in dollars and cents? If so, how many dollars and how many cents?

The only fair basis of computation of the value of sanitary work is comparative. Let us first find the average value of human life in dollars and cents, and then compare the death-rate in cities where sewerage and pure water-supply and all other sanitary conditions are supposed to be observed, with those cities where these conditions are not observed, or if at all, but poorly. If we find in the one case a much lower death-rate than in the other, it is but fair to presume that the sanitary care exercised in the one and neglected in the other, has had something to do with this decreased death-rate. We must take things as we actually find them, and if typhoid prevails in two cities, the one noted for its filthy condition and lack of sanitary regulations, and the other having good sewerage and pure water, and the death-rate in the former during the epidemic is largely in excess of that in the latter, we at once attribute the difference to the causes named. The lives lost, the time lost, the stoppage of business, that might have been saved or prevented in this instance, by proper sanitary regulations, may justly be taken into account in considering the money value of sanitary work.

In this world everything, life, health, and all these bring, are reduced to a money value. Real estate, sugar, cotton goods, potatoes, a human life, are all worth just what they will bring in the market. We no longer put up a human life at auction, to the highest bidder, but the only difference now is, that each man owns and sells his own life, his knowledge, his labor, and these are worth just what he is himself capable of earning over and above the bare cost of maintenance. Dr. Farr, who is an oft quoted authority on this subject, carefully estimates the average value of the English farm laborer, at $1,200 of our money. This would be considered a low estimate for the American laborer, for it is based upon the lower wages of England. It will answer our purpose, however, for the estimate is a conservative one. The money value of a woman is estimated as 16 to 26, or $740 as compared with $1,200 for a man. For the purposes of this article, therefore, it is sufficient to estimate an average human life at a value of $1,000, and this is low enough, for it is doubtful if any person in this room values his or her life at a less figure.

Now we reach the very practical question, How many lives at $1,000 each, may be saved to a community by sanitary work? Let us see what has been done. Quoting from valuable tables presented by Erwin F. Smith, at the Ypsilanti Sanitary Convention, in 1885, we find that the death-rate in Munich, from typhoid fever, for 8 years, 1851 to 1859, before the introduction of sewerage and good water-supply, was 21 to each 10,000 of population, while during the 10 years, 1874 to 1884, after the introduction of a sewerage system and pure water, the rate was but 6.3, and during the five years of this period, 1880–1884, it was but 2.7: in Berlin, before, 7.2; after, 2.9: in Vienna, before, 12.0; after, 2.1: in London, before, 10.2; after, 4.5: in New York City, before, 4.9; after, 2.9: in Boston, before, 17.4; after, 5.6:

in Brooklyn, before, 3.2; after, 1.5. Still more marked are the figures taken for the five years, 1880–1884, comparing the death-rate from typhoid fever per each 10,000 of population in cities having good sewerage and in those having none, or if any imperfect. Munich shows a rate of 1.7; Frankfort, 1.4; Hamburg, 2.6; Berlin, 2.9; London, 2.3; New York, 3.0; Brooklyn, 1.5; Vienna, 2.1. Now, we compare Paris with a death-rate of 9.9; Palermo, 13.1; Catania, 19.0; St. Petersburg, 9.9; Baltimore, with an abundant water-supply but poor sewerage, 4.8; Cincinnati, 7.3.

Again, during the cholera epidemic of 1865–66, New York with its water-supply and sewerage system, lost but 12.8 to each 10,000 of population; Brooklyn, 16.5; Boston, 0.6; London, 18.4; Glasgow, 1.6; while New Orleans, with its unfavorable sanitary conditions, lost 72.7; St. Louis, 173.0; Chicago, 43.7; Cincinnati, 62.0; Memphis, 268.0; Palermo, 197.5; Constantinople, 133.0.

These are startling figures, and should receive the careful consideration of all who are interested in the welfare of their fellow beings, or who value their own lives at even so low a rate as $1,000. But few instances are quoted where many could be given, but enough to prove conclusively that sanitary work is an important factor in the preservation of human life. In the cases cited, the money value of the sanitary work done, was the number of lives saved, at $1,000 each. The aggregate, as will readily be seen, would be enormous, —sufficient and to spare to inaugurate and support a complete sanitary system in every one of the cities named.

The limits of this paper will not allow an exhaustive discussion of the question, Does sanitary work accomplish its object? The few statistics given help to answer this. Pages of tables could be used to show the amount of money saved given communities in the preservation of life and health through sanitary work, but the few minutes given me will not permit; and for the purposes of this article it is enough to show something of what has been accomplished in Michigan, and estimate its money value.

The date of systematic sanitary work in this State is identical with that of the organization of the State Board of Health. The average annual death-rate from scarlet fever, for five years, 1869 to 1873, inclusive, before this work began, was 589. For eleven years after, from 1874 to 1884, inclusive, it was 442; a saving of 147 each year. Comparing the average deaths for each of these periods with the average population of each, we find the average number of deaths for each 10,000 inhabitants during the former period was 4.85; during the latter, 2 75. The total number of lives saved, attributable in all fairness to this work, was 3,718, with a money value of $3,718,000,—and this in the one disease, scarlet fever. Of the deaths from small-pox, figures show a decrease during the same periods, from 8 48 to 2.42 in each 100,000 of population, and a total saving of life of 1,073, or $1,073,000 in value. It will thus be seen that sanitary work, through the direct influence of the State Board of Health, probably saved to the State during these eleven years, from these two diseases alone, an average value in human life of $135,545 per year. If we add to scarlet fever and small-pox, the long list of other so-called preventable diseases, typhoid fever and typhus fever, diphtheria, cholera, and a score of others more or less controllable or preventable by proper sanitary conditions and surroundings, and more fatal in results than either of the diseases first named we are almost ready to adopt the statement made by careful comparisons, that 7,500 lives are saved in Michigan each year, through

the sanitary work of its State and local boards of health. This would mean an annual saving of $7,500,000 at the low estimate of $1,000 per life. In these estimates no allowance is made for loss of time to those who recover. English parliamentary reports state that there are two persons sick, throughout the year, for each person who dies. It is a very difficult matter to estimate, at all correctly, the saving that may be attributable, in this way, to sanitary work in Michigan, but it may readily be seen that it mounts up into the million of dollars annually.

Some statistics given in the proceedings of the July meeting of the State Board of Health have an important bearing upon the subject of this paper. Reports from local health officers for 1886, showed that in 102 outbreaks of diphtheria, in Michigan, in that year, where isolation or disinfection had been neglected, the average number of cases to the outbreak was 16.18, and of deaths, 3.23; while in 116 outbreaks where isolation and disinfection were enforced, the average of cases was but 2.86, and deaths but 0.66. In scarlet fever, during the same time, where health officers acted promptly and efficiently, and the people coöperated perfectly, there were only one-fourth as many cases, and about one-fifth as many deaths on the average as in outbreaks where they did not so act. The tables show in 45 outbreaks where sanitary conditions were not observed, an average of 13.84 cases and 1.20 deaths, while in 59 outbreaks where these conditions were observed, the average of cases was but 3.02, and of deaths but 0.22.

No reference has been made in this article to the vast amount paid physicians, and nurses, for medicines and burial expenses, and the other necessary expenses attending sickness and death. The question has been considered solely from the standpoint of the state, and not the individual. The money paid the nurse, the physician, the druggist, the undertaker, is not lost. It is a mere exchange of values, a change in ownership. It is not a destruction of values. It is a loss to the individual who pays, but is a gain to the one who receives. Time lost in sickness is an absolute loss of values because it can never be regained. Life lost is the same. Both mean loss to the state, absolute and beyond recovery.

To the individual "whose capital is his health," to the tax-payer, who aids in the support of state institutions, many of whose inmates are there through disease plainly brought on by ignorance of, or neglect of, sanitary laws and regulations, to all whose time is money and whose lives are valuable to family and friends, this question of sanitary work should possess deep interest, not general but personal. It is the individual who is affected, and, through him, the state. The individual loses in time and money, and even if his neighbor gains by his misfortune, the innate selfishness of man's nature is such that no great degree of satisfaction can be derived by the loser from that fact. It is sufficient to look at this subject from the more disinterested standpoint of total and net loss to the state and individual by absolute destruction of time and life; but if one is inclined to view it from the narrower plane of personal loss through another's gain, the aggregate in dollars and cents becomes enormous, and in either case the question of sanitary reform becomes at once one of the most important questions of the day.

MONEY VALUE OF SANITARY WORK.

BY A. ARNOLD CLARK, OF LANSING, MICH.

We are often told that it is not the proper thing to talk about the money value of a human life, and I can see how it is that men dislike to speak of the affections and the emotions in this Thomas Gradgrind sort of a fashion. They hate to see the pound of flesh put in the balance with the three thousand ducats. But certainly there can be no objection to talking about the money loss to a community from sickness. Max von Pettenkofer estimates that every citizen of Germany is sick, on the average, twenty days out of each year, or five per cent of his entire time. This estimate is based upon reliable data—a study of the sickness-rate in the Prussian army for a series of years. If every citizen in Michigan is sick, on the average, twenty days out of each year, that means an annual loss of forty million days. If the cost of medical attendance, nurses and medicine, be placed at the very low figure of fifty cents per day, and the loss of wages at the same low estimate, you see at once, without performing the operation, the extent of the financial panic which Michigan suffers every year from sickness.

I thought, as I listened to the figures cited in the paper just read, that sometimes figures of arithmetic are more eloquent than figures of speech, but the trouble is, these figures are so enormous that we cannot understand them. Let us take just one disease—a disease which we know enough to prevent, a disease which is especially fatal to men in the prime of life—I refer to typhoid fever. Dr. Vaughan said last night that every death from typhoid fever was suicide or homicide. Now, if every typhoid patient is sick, on the average, thirty days, if the cost of medical attendance be placed at the very low figure of fifty cents each day, and if the loss of wages by these patients be placed at the low figure of $1 per day, the money loss from typhoid sickness in Michigan cannot possibly be placed at less than $500,000 each year—to say nothing of the value of those lives lost to the community. There was an outbreak of typhoid fever in Plymouth, Pa., last year, which resulted from neglect properly to disinfect in just one case. In that outbreak there were over a thousand cases of typhoid fever and they cost the village nearly $100,000. Does it pay to spend money to prevent disease?

As we have seen, in those outbreaks of diphtheria and scarlet fever in Michigan last year where the recommendations of the State Board of Health were not properly carried out, where patients were not properly isolated, and houses were not properly disinfected, there were five times as many cases, and five times as many deaths from these diseases to the outbreak, as in those localities where these recommendations were carried out to the letter. I do not suppose it cost those officers much to disinfect those houses, but by so doing they saved two or three hundred lives, and prevented two or three thousand cases of sickness. If each diphtheria patient is sick only fifteen days, and the cost of medical attendance is only fifty cents, then they saved, just in diphtheria alone, about twelve or fifteen hundred dollars to the state—and that does not count the wages which they would have lost, and does not count the funeral expenses of those who would have died, or the value of their lives to the community.

If there is any doubt as to the amount of money expended for sickness, reflect that there are four thousand doctors in Michigan. They get each year, at least, $1,000 each. Then that means $4,000,000 which we pay for sickness. If Ben Franklin was right when he said "time is money," then sickness is poverty, and every local board of health that does its duty is an anti-poverty society. How much better it would be to make anti-poverty societies of these doctors and pay them to keep us well and then dock them their wages when we get sick. There are some laborers in Streator, Ill., who pay two or three doctors to keep them well. Each member of this coöperative society pays $1 per month, whether sick or well, and when sick has prompt attendance at no extra cost.

I said a few moments ago that men disliked to talk about the money value of a human life. It was owing to this dislike that the common law refused to allow damages for the taking of a human life. It was on account of the false idea that it was wrong to set a money value on a man. Cooley says this was "making a sentimental objection of more consequence than justice itself." This defect in the common law was remedied by Lord Campbell's Act in England and by similar statutory legislation in this country. The minimum amount of damages which can be recovered in Connecticut for the wrongful taking of a human life, either by negligence or feloniously, is fixed by statute at $1,000. The maximum amount is $5,000. The maximum is fixed in most States at $5,000. In California, a child 7 years old was run over by an engine and killed; $5,000 in damages were awarded. The ground for recovery in every case must not be injured feelings, or mental suffering, but an actual pecuniary loss, and is based upon the reasonable expectation of what such a man would earn for his family had he lived. Now, whether we consider man as the law considers him, whether we sit down with a life table in our hands, as did William Farr, and calculate the future annual earnings of a man at a given age, then substract his future cost of living, and take the capitalized remainder as the value of the man to the community, whether we say, as some have said, that each man is worth to the community, just what it will take to reproduce, to train up from infancy, another man just like him, or whether we remember in a simple, common sense sort of a way, that a few years ago, men were actually sold by their fellowmen, and that in the slave markets of the south the average value of a man was $1,000,—however we consider it, every man who is not sick or a vagrant, will give the world more than he will take from it, and the old idea of Malthus, that every life was a burden to the community, that every great epidemic was a blessing to the community, has taken its place among the other exploded notions of the past. No man ever yet lived and labored but the world was richer because he lived and labored; and, in an ideal community where all are employed, every life is a money blessing to the world. Every death tends to bankrupt the nation. Sickness in a community is a financial panic.

From this broader standpoint, considering the value of every life to the community, the money loss from sickness and deaths from preventable diseases alone is too enormous to be grasped even by the imagination. Dr. Kellogg, a few years ago, estimated the loss from preventable sickness in Michigan at $10,000,000. Turn to the last registration report of this state and you will find that, not counting diseases of the digestive system, not counting nervous diseases, not counting deaths by accident, counting only the com-

municable diseases, such as small-pox, scarlet fever, diphtheria, typhoid fever, whooping cough, measles, and consumption,—over one-fourth of all the deaths which occurred in this state last year were diseases which we know enough to prevent but do not.

If it is asked why consumption is included in the foregoing list of communicable and preventable diseases, I can only reply that we are constantly adding to the list of communicable diseases,—constantly adding to the list of preventable diseases. We are not exactly like the western doctor who hung out a sign board—"Incurable diseases a specialty,"—but we are constantly finding out new causes and the list of preventable diseases is constantly swelling. Two hundred years ago scurvy carried off more English sailors than all the battles and calamities of sea life; five hundred years ago leprosy was as common as whooping-cough is now. At present both of these diseases have practically disappeared. Now and then a Jenner discovers vaccination and finds out how to prevent a disease that has depopulated the nations of the old world; now and then a Capt. Cook finds a preventive of scurvy; now and then a Howard tells us how to stop jail fever; now and then a Pasteur finds a prophylactic for that dread disease, hydrophobia; little by little we find new ways to reach the germs, and day by day man's chances for "life, liberty and the pursuit of happiness" are bettered.

In the seventeenth century the average duration of life was twenty-four years. The seventeenth century! When, as Pascal has said, disease was the normal state of Christians; when men used to boast that neither they nor their ancestors had taken a bath for a thou sand years. In the eighteenth century the duration of life had increased to twenty-nine years, while at the present time the average man may hope to live forty-nine years, and Prof. Flourens, and others, tell us that if we lived properly we ought to live to be 100 years old. Long life and health mean happiness. Sickness means irritability. But more, long life and health mean national wealth, and James Anthony Froude was right when he said, "What is the commonwealth? The common health."

We are here to inquire how we can prevent deaths and what causes the most deaths. An old French poem tells how Death once held a prize contest among his agents, among whom were War, Pestilence and Famine, and that the reward went to Intemperance. Without under-estimating the evils of the drink problem, I think we can all agree that the most active allies and the best friends of death are those diseases which we know enough to prevent but do not. Certainly they are more fatal than war. In the Crimean war only 20,000 French soldiers died in battle,—75,000 died of disease. Of our Michigan boys who enlisted in the Union army during the late war, disease carried off four times as many as died on the fields of battle or by the wounds of battle. Our most dangerous foe is this army of disease germs. And yet we spend thousands of dollars to maintain a standing army to protect us against those foreign foes with whom we ought to be at peace. How much more reason for maintaining a large and well paid army of health officers to protect us against these little invisible, yet none the less invincible hosts,—these germs which find a hiding place in our garrets and our wells, which lurk in the rubbish of our cellars, which linger in our hair and clothing, which cling to our beds, our carpets and our walls, which are brought to us long distances by letters from our friends—more ingenious than the famous Greek horse, which steal in with the family cat, which come with the flies, which congregate in

poorly-ventilated churches and school-houses, which suddenly leave one locality and as suddenly colonize in another,—this Germ army in whose destruction lies our safety!

We buy hose-carts, hook and ladder trucks, put in electric alarms and engines, and keep horses ready to run at a moment's notice to save our buildings from fire. The expenses of the fire department in the city of Lansing are $6,000 annually. The annual expenses of the fire department in the city of Detroit are nearly $200,000, to say nothing of the cost of maintaining water-works. Yet the total fire losses paid by the insurance companies operating in this State, amounted last year to less than $2,000,000. Of course, the actual fire loss was much more, but I do not believe the annual money loss from fire in Michigan is as great as the annual money loss from sickness and deaths. Then why not have in every locality a well-paid local board of health, a sanitary fire department ready at a moment's notice to extinguish a conflagration of some communicable disease?

This sanitary convention will not cost the citizens of Traverse City much of anything; it will not cost the State of Michigan much of anything. Probably, all told, it will not cost more than $100. The money value of sanitary work! Will it lead to a local sanitary organization? Will it lead to the establishment of a sanitary fire department? Will it lead to better food and better water? Will it lead to school-houses with better desks, better books, with more light, more air, and less carbonic acid gas? Will it save a human life? Will it prevent an epidemic? If so, then it has paid for itself ten thousand times.

Arthur Hazlewood, M. D., member of the State Board of Health, then made some interesting unwritten remarks on the prevention of contagious diseases.

CLOSING REMARKS BY FRANK HAMILTON, PRESIDENT OF THE CONVENTION.

In his remarks closing the convention, the President thanked those from abroad for the papers and discussions, and expressed his belief that the people of Traverse City would profit by what they had heard, that sickness would be prevented and lives would be saved. He cordially invited the State Board of Health to hold another Convention in Traverse City at some future date, when he hoped there would be seen the fruits of the Convention, which was now declared adjourned.

AMERICAN
STATISTICAL ASSOCIATION

PROCEEDINGS AND ADDRES

AT

SANITARY CONVE

HELD AT

OWOSSO, MICHIGA

NOVEMBER 22 AND 23,

UNDER THE DIRECTION OF A COMMITTEE OF THE
HEALTH AND A COMMITTEE OF CITIZENS O

(SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD
YEAR 1888.)

(Reprint No. 206.)

MICHIGAN STATE BOARD OF HEALTH
SEAL.

BY AUTHORITY.

LANSING, MICH.,
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1888.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

OWOSSO, NOVEMBER 22 AND 23, 1887.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1888.

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT OWOSSO, NOVEMBER 22 AND 23, 1887.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1888.

[This account of the convention is prepared from papers furnished by the authors, and from notes by Rev. C. De. W. Brower.]

This convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Owosso, acting with a committee of the State Board of Health.

The following persons constituted the local committee: Stanley E. Parkill, *Chairman*; W. M. Kilpatrick, E. O. Dewey, A. M. Hume, M. D., Rev. George H. Wilson.

The committee from the State Board of Health consisted of Henry B. Baker, M. D., Lansing.

The officers of the convention were: *President:* Rev. George H. Wilson; *Vice-presidents:* E. B. Ward, M. D., Laingsburg; S. E. Gillam, M. D., St. Johns; J. N. Eldred, M. D., Chesaning; E. V. Chase, M. D., Elsie; A. T. Nichols, Corunna; D. W. Garrison, Vernon; Robert Smith, Ithaca; A. B. Clark, Morris; James Osburn, Owosso; *Secretary:* A. M. Hume, M. D., Owosso; *Assistant Secretary:* Rev. C. De. W. Brower.

The medical profession was well represented, there being present among others, from Owosso, Drs. C. P. Parkill, A. J. Robb, S. S. C. Phippin, C. McCormick, B. S. Knapp, J. D. Crum, A. M. Hume, C. A. Osborn, A. L. Arnold, M. E. Knapp, J. Perkins, Mrs. Willoughby; from Detroit, Drs. E. L. Shurly, H. C. Wyman, and Health Officer S. P. Duffield; from Lansing, Dr. H. B. Baker, representing the State Board, and Dr. Marshall; from Greenville, Dr. John Avery, President of the State Board; from Laingsburg, Dr. E. B. Ward; from Henderson, Dr. Otis Gould; from Corunna, Drs. W. C. Hume, A. R. Ball and W. S. Jones; from Chesaning, Dr. J. N. Eldred; from Howell, Dr. J. A. Wessinger; from Grand Rapids, Dr. Hugo Lupinski, health officer; from Durand, Dr. A. G. Cowles; from St. Louis, Dr. Stiles Kennedy; from Petoskey, Dr. M. Edna Haver-

field. Among other visitors from a distance was Mr. John K. Allen, associate editor of *The Sanitary News,* Chicago.

The committee of arrangements took special pains to inform the citizens thoroughly regarding the convention, and the clergymen were requested to deliver sermons appropriate to the convention work on the Sunday preceding. As a result, all the sessions of the convention were well attended, the number of ladies present being especially noticeable. Great interest was manifested in the papers read and in the discussions which followed, and the benefit to the city cannot be over-estimated.

First Session—Tuesday, November 22, at 2 P. M.

The convention was called to order by the president. After prayer by Rev. John Donnelly, Hon. F. H. Watson delivered the address of welcome. He said that Owosso considered herself fortunate in having the convention meet with her. The subject of health was one which should interest the State more than any other, unless it be the public morals. The meetings would be of wide-spread benefit.

In responding, Dr. John Avery, President of the State Board of Health, said that the State Board was glad to meet in Owosso. They were glad to meet in any city which was ready to be informed about the public health. It was expected that those who attended would become interested and thereafter labor as apostles of sanitation, and that thus a circle would be started, the limit of which no one could determine. It is in such conventions that people become enlisted in the good work.

After a brief, but interesting and suggestive address by the president of the convention, a paper on the Prevention of Contagious Diseases, was read by Dr. John Avery, of Greenville.

THE PREVENTION OF CONTAGIOUS DISEASES.

BY JOHN AVERY, M. D., PRESIDENT OF THE STATE BOARD OF HEALTH.

It will hardly be necessary at the present time and with our present knowledge, to enter into any argument to prove that certain diseases are contagious, and that all contagious diseases are more or less preventable.

All physicians and most if not all the people of Michigan, know that Small-pox is contagious and they make that knowledge practical in their efforts to prevent its spread. They know that vaccination is a preventive and they resort to it for themselves and their children. If sometimes they neglect it, they regard such neglect as a duty postponed to a more "convenient season."

A report of a case of Small-pox in any community in Michigan, at once puts everybody on the defensive. People keep away from it, and shut their doors against all who have been exposed, and shut up the unfortunate victim and his family. Quite likely the neighborhood will become panic-stricken, and will need a cool-headed health officer to allay fear and to see that the afflicted family does not suffer from want of proper care. The unvaccinated will improve this occasion to fulfil the neglected duty, and this is the compensating good of an occasional case of small-pox. That we have no small-pox in

Michigan to-day is due to this kind of knowledge throughout the state and to the watchfulness of sanitary sentinels in every town.

But there are other contagious diseases which seem to abide with us and about which the people are not so well informed, or at least do not have the same confidence in preventive measures. This is true of whooping-cough, measles, scarlet fever, diphtheria and typhoid fever. Ten die annually of each of these diseases to one of small-pox. Measles and whooping-cough everybody knows to be contagious, yet little or no attempt is made either by physicians or the people to prevent their spread. Why is this? It is because the impression is quite prevalent, that children must have these diseases sooner or later and it is as well to be rid of the bother first as last. Hence we see almost daily, children with whooping-cough going to our public schools, or unrestrained in their play with other children, until they succumb to an inflammation of the lungs following the irritation of the air-passages induced by the terrible spasmodic coughing. Now why is it necessary that children should have whooping-cough? Everybody knows that it is contagious, that each case follows contact with another case. Everybody knows that children often die with it, or from the effects of it; and everybody knows that it often lays the foundation for other diseases which last through a shortened life.

Suppose every child in the State of Michigan with whooping cough and those who have been exposed to it could to-morrow morning be separated from the unexposed children, and kept away from them until fully recovered, how long would it take for the disease to die out in this state? Only about three months. And then we would have to depend upon some neighboring State for a new supply of germs to start again. Well we could get along very well without their germs and save two hundred babies annually by doing so. Is it not worth our while to make the attempt to drive this disease out of the State and to keep it out and save the two hundred children that annually fall victims to it?

Measles is another contagious disease of which many children die annually in Michigan, and many others are made invalids through life from its effects. Under the belief that it is necessary to have this disease at some time and that children are less liable to be severely sick with it than adults, little or no attempt is made to arrest its spread in a community, and it is allowed to take its own course. But where is the necessity for either adults or children having this disease? Children do not have it unless they are exposed to it; and there are many things a child had better catch than the measles—the morning sun, the summer breeze, the freckles, or his mother's slipper and his teacher's strap (and that is generally as unnecessary as it is valueless).

Measles is neither necessary nor desirable. It brings anxiety and suffering. It means loss of time and money. It maims and it kills our loved ones. Why not drive it from our midst, and save this suffering and loss of life, by keeping away from it and by keeping those who have it away from those who have not been exposed? Every case of measles comes from a preceding case. Its early symptoms are generally easily recognized. Its spread through a neighborhood is much more easily controlled than either diphtheria or scarlet fever. Its germs do not seem so tenacious of life. They are not so often carried in the clothing of protected persons, and yet they may be and sometimes are so carried.

That the Michigan State Board of Health has not made such unrelenting warfare upon measles and whooping-cough as it has upon diphtheria and scar-

let fever, may be explained by the adage that "when there are too many irons in the fire some are likely to burn." But it has not entirely neglected them. It has been quietly gathering statistics and storing up ammunition and arranging its batteries for an attack along the whole line.

Typhoid fever is another contagious disease, for the existence of which no man can offer a rational excuse. It strikes down our citizens by hundreds annually, and at the most productive and useful period of their lives. It selects those in the prime of life in preference to young children or the very aged. It is not easily communicated by contact or carried in the clothing of attendants or callers, but when the dejections of a typhoid fever patient are thrown upon the ground or into the privy-vault and from there filter into the well or water-supply of the family or neighborhood, the infectious agent of the disease which is contained in these discharges finds its way into the drinking-water and communicates the disease to those who use the water. It is a filth disease and its presence in a neighborhood is a crime chargeable to some one.

Diphtheria and scarlet fever are the diseases most appalling to the mothers of our state. They are insidious in their methods of dissemination. They steal the jewels of the household, often leaving not one. They shut out light and joy from our homes. They leave only sadness and gloom when they have passed. They are extremely contagious and very fatal, but like all other contagious diseases may be prevented or at least may be restricted.

The State Board of Health has labored incessantly from its organization to the present time, to instruct the people of the State in regard to the dangerous character of these diseases, and to inform them of the means by which they could protect themselves against these scourges. It is good to know that its labors have not been wholly fruitless nor wholly unappreciated by the people of the State. It has labored earnestly and employed all the means at its command. but much remains yet to be done.

It is well known to every physician and to many others, that while these diseases are contagious and while cleanliness does not wholly exempt from them, that filth, bad air (one form of filth) damp and unventilated basements, decaying vegetables and all forms of decomposition in and about the house and premises invite their presence, multiply their germs, aid their distribution and intensify their character.

So, as the first step towards the prevention of contagious diseases, the citizen has a duty to perform. It is to clean up and keep cleaned up. Each for himself must look after his own house and its surroundings. The cellar must be made and kept clean and sweet. No decaying vegetables of any kind should be permitted to remain there. The storing of vegetables in large quantities in the basements of dwelling houses is at best a dangerous practice. There is more economy in building root-cellars separate from the house than incurring the expense of sickness liable to result from storing vegetables in house cellars. If the basement is damp it must be drained and a cement floor laid—better a cement floor in any soil. The walls and ceilings overhead should have a coat of white-wash with quicklime once a year. The windows protected by wire netting must be open at all times when the temperature is above freezing. All chimneys should start from the bottom of the basement and have an opening there to carry off bad air. In those houses where the chimney starts from the top and ends half way down, a tin or galvanized-iron pipe connecting with the chimney and extending to the bot-

tom of the cellar will act as a ventilator. Confined air with musty and foul odors is sure to find its way into the living and sleeping rooms as soon as the temperature of these rooms is raised above that of the basement.

No stagnant water should be permitted near the house. A little time spent in draining it off or in filling up the hole will save money and health.

The wood-house must be kept clean and free from decaying wood, chips and bark. The back door and yard should expect visitors every day and be prepared to receive them.

If the well is depended upon for the water-supply it should either be a drive or cement well, and protected against the possibility of contamination from surface drainage.

The cess-pool and the privy-vault,—what shall we do with them? Well, do without them! And where there are no sewers and no water carriage substitute the dry-earth closet for the privy-vault and take care of it. Burn such of the kitchen waste as can be burned, and feed the waste water to the grape vines, rose bushes and fruit and shade trees, either by a system of underground drainage or by carrying it directly to them.

This, then, is what the citizen may do in a general way to protect himself and family against disease.

What can the authorities do? They can at least insist that the neglectful citizen shall do his duty. They can and should keep the streets and alleys clean and free from rubbish. They should provide a place where the inhabitants can dispose of their refuse in a manner that will be neither offensive or injurious to any one. This may be done by providing a crematory, or by using the refuse to fill up some waste place remote from inhabitants.

In Greenville the authorities have purchased a piece of marsh land lying just under a high bluff. The refuse of the city is carted on to the marsh and then covered with earth from the bluff. The marsh drains into the river just below the city. This arrangement seems satisfactory to Greenville at the present time; but if some town just above us was to do the same thing, we would possibly remind it of the golden rule, "Do unto others as ye would they should do unto you"—a rule as safe and wise in sanitary matters as in religion.

It will be the duty of the authorities to provide a pure and abundant water-supply for the inhabitants. Every well in a thickly settled community is suspicious. The water-supply should be above suspicion. This can be so in towns of any considerable size, only when water is supplied from an unquestioned source through some system of water works.

Drainage and sewerage must be established and maintained with all the safe guards known to sanitary science, and this will fall within the duties of the municipal authorities.

It will be the duty of the health officer to advise, instruct and to constantly prod both the citizens and the authorities. He must be ever on the watch. He must guard every avenue through which disease can approach. And he must live in hopes, that, at sometime in the future, his efforts to prevent and restrict disease will be better appreciated and better paid for. The sick are willing to pay to be cured; but the well are unwilling to incur any expense to keep well. Let us hope this will not always be the case, but that the time will come when the best paid physician will be the one who best knows how to prevent disease.

But, unfortunately, when the inhabitants and authorities have done all in

their power to make "clean their habitations" and prevent disease, the unseen destroyer will sometimes make its appearance in the shape of cholera, diphtheria, scarlet fever, or typhoid fever; but with our homes and our cities in order we are prepared to deal with it.

That we are not to-day reaping a terrible harvest from the seeds of cholera planted on Hoffman island in New York harbor from the infected ships Alesia and Brittania is due to the advance made in sanitary science during the last twenty-five years. Who shall say that this exemption from a fearful scourge is not worth all the preparation has cost?

But quarantines are not always perfect. Holes large enough for small-pox, diphtheria and scarlet fever to slip through may let cholera through. Then every town along the line of travel must defend itself.

If our houses and our cities are clean, our water pure, the air we breathe pure, and the standard of health maintained at its maximum, by temperance, nourishing food and comfortable clothing, and we always have a watchful eye upon the enemy, we will have our fortifications as complete as human foresight can make them. What city is so fortified? I fear not many.

But suppose any of the contagious diseases elude the watchfulness of our sentinels, defy our fortifications and invade our homes, then other duties arise which must be promptly and efficiently discharged. There need be no panic, even if the invader be small-pox. A well organized and well drilled garrison is never surprised and never becomes panic-stricken.

Prompt notice must be given by the householder to the health officer of the presence of an infectious disease. The law requires this. The health officer will see that the house is placarded, the infected person isolated and the secretary of the State Board of Health notified.

Now all this seems quite easy to do. To placard the house and notify the secretary are easily and quickly done. Not so, to effectively isolate the patient. Very likely the house is small, the family poor and dependent upon the daily labor of its head for support. To isolate such a family implies that they must be supported at public expense during the period of their affliction. They must not be allowed to suffer for want of food, medicines, medical attention or proper nursing. All children not of the household, and persons not employed about the house must be kept away. They can do no good and are only in the way and liable to spread the disease. Nurses must change their clothing and thoroughly disinfect their persons before going out. They must not come in contact with unprotected persons before doing this.

The danger of permitting persons from an infected house to go about their daily work, is well illustrated by a case that occurred in Greenville a few weeks since. A little girl, the daughter of a laboring man was sick with scarlet fever. The father was employed on a new building, the owner of which had three children. These children were in the habit of playing in the building where the man was at work. All three of these children were taken sick with scarlet fever, within three days of each other. The infection was carried in that man's clothing. The employer had better have paid the man his wages and compelled him to stay at home. In this case the authorities were at fault.

The care of the sick will impose other duties upon parents, friends, physicians and authorities.

The patient should be given a large and well ventilated room, if uncarp-

eted and the walls unpapered, all the better. A few rugs or pieces of carpet may be permitted. The furniture should consist of a bed, a couch, a commode, a small table and one or two chairs. No clothing should be permitted in the room or in the adjoining closet, except such as is needed for immediate use in the room.

Nurses should not eat in the sick room. No drinking water or food should be allowed to stand in the room, and all unused portions taken into the room should he disposed of in the same manner as the excreta of the patient. Disinfecting solutions should be kept on hand ready for use by the patient and attendants, (formulas for which are furnished by the State Board of Health, and may he found appended to this paper.) All discharges from the mouth and nostrils should be received upon bits of old muslin and at once burned. Fire is the best disinfectant, and all articles not of value, used about the patient, should be burned. All bowel discharges should be received into a vessel containing disinfecting solution, at once covered and disposed of in such a manner that no posible danger can come from them. All clothing necessary to be removed from the room, should be wrapped in cloth saturated with a disinfecting solution, and such as will not be injured thereby immersed at once in boiling water, and the remainder disinfected by fumigation with sulphur. The room should be kept comfortably warm and well aired, and when vacated, it together with the furniture and clothing in it, must be thoroughly fumigated in accordance with directions furnished by the State Board.

These directions are general and apply to all infectious diseases.

Special diseases having particular sources of danger will require a word. In scarlet fever the infectious material is given off from the surface of the body and is probably present during the whole course of the disease and convalescense, which often continues five or six weeks, making isolation and disinfection tedious and difficult. The infection adheres with great tenacity to clothing, furniture, walls of the room and to the hair and whiskers of attendants. Dogs and cats must not be allowed to enter the room. Slight cases of the disease often go unrecognized until a more susceptible child is taken with a severer form. Convalescense is protracted—and a convalescent child is always impatient of restraint. A boy who has been sick a week or ten days, when he begins to find his legs again is a very unruly patient to control. It will tax the wisdom of the physician, the love and patience of the mother, and the authority of the father to keep him within restricted limits. Besides it is often difficult to make people understand how a child apparently well can give the disease, while the truth is the minute particles thrown off from the body during the whole process of peeling are loaded with germs and are the principal means of distributing the disease. It is obvious then that any system of isolation to be effective in this disease must be sustained by the intelligent aid of the whole community. Hence the importance of correct information among the people in regard to the dangerous character of this disease and the difficulty of controlling it. The poison is more subtle than that of small-pox, the disease itself is more dangerous, and we have no preventive like vaccination for it. Children outgrow susceptibility to it, hence no effort should be spared to protect them against its ravages during the period of their liability to contract it.

In diphtheria the infection is contained in the discharges from the throat and nasal passages, and is more under control of the attendants than that of

scarlet fever. These discharges should be received upon bits of cloth and burned. Isolation and disinfection will be as necessary in this disease as in scarlet fever and small-pox.

In typhoid fever there is little or no danger arising from contact with the patient. The infectious material is contained in discharges from the bowels. These carelessly thrown upon the ground or into the privy-vault, find their way into the drinking water and thus convey the disease. If the sick room is badly ventilated and the discharges not immediately disinfected, the air may become infected by the germs and persons breathing it take the disease. If the drinking water is suspected, and it should be in every case of typhoid fever, abandon it or boil it.

The precautions necessary to limit this disease are a well ventilated sick room, thorough disinfection of the discharges and a most unceasing watchfulness over the water-supply. Always pure air and pure water, never typhoid fever.

APPENDIX.

METHODS OF DISINFECTION RECOMMENDED BY THE STATE BOARD OF HEALTH.

In diphtheria the discharges from the throat, nose, and mouth are extremely liable to communicate the disease, and should be received in vessels containing a strong solution of copperas (sulphate of iron), or on soft rags or pieces of cloth, which should immediately be burned.

In typhoid fever and other dangerous communicable diseases the discharges from the kidneys and bowels are dangerous, and should therefore in all cases be received upon papers or old cloths and promptly burned, or be received in vessels and thoroughly disinfected as follows: Disinfect each discharge from the bowels by thoroughly mixing with it at least one ounce of chlorinated lime in powder, or one quart of "Standard Solution No. 1," recommended by the American Public Health Association's committee.* In country districts, villages, and small cities, where the privy is not far distant from a well, discharges should not be thrown into a privy-vault, but after being disinfected, they should be carried a greater distance from any source of drinking-water and then covered with earth.

Rags, closet-paper, or other similar material used about the patient, should be immediately burned.

Privies, water-closets, cess-pools, gutters, drains, sewers, etc., should be frequently and liberally treated with copperas solution

Sulphate of iron (copperas) dissolved in water in the proportion of one and a half pounds of the sulphate to one gallon of water, is a good solution for chamber-vessels, water-closets, etc. When much is wanted it may be prepared by hanging a basket containing about sixty pounds of copperas in a barrel of water.

Nurses and attendants should be required to keep themselves and their patient as clean as possible; their own hands should frequently be washed and disinfected by chlorinated soda.

Soiled clothing, towels, bed-linen, etc., on removal from the patient, should

* "Standard Solution No. 1" is made by adding to each gallon of soft water four ounces of chloride of lime of the best quality, which should contain at least 25 per cent. of available chlorine. "Use one quart of this solution for the disinfection of each discharge in cholera, typhoid fever, etc. Mix well and leave in vessel for at least one hour before throwing into privy-vault or water-closet."

soon be placed in a pail or a tub of boiling-hot zinc solution, made in proportions as follows: Water, one gallon; sulphate of zinc, four ounces; common salt, two ounces. Soiled clothing should, in all cases, be disinfected before sending away to a laundry, either by boiling for at least half an hour (it may well be boiled in a zinc solution), or by soaking in a strong solution of chlorinated soda.

Cotton, linen, flannels, blankets, etc., should be treated with the boiling-hot zinc solution, introducing them piece by piece, securing thorough wetting and boiling for at least half an hour. Heavy woolen clothing, silks, furs, stuffed bedcovers, beds, and other articles which cannot be treated with the zinc solution, should be hung in the room during fumigation, pockets being turned inside-out and the whole garment being thoroughly exposed. Afterward they should be hung in the open air, beaten and shaken. Carpets are best fumigated on the floor, but should afterward be removed to the open air and thoroughly beaten. Pillows, beds, stuffed mattresses, upholstered furniture, etc., after being disinfected on the outside, may be cut open and their contents again exposed to fumes of burning sulphur. In no case should the thorough disinfection of clothing, bedding, etc., be omitted. Infected clothing and bedding have been known to communicate diphtheria months after their infection.

The body of a person who has died from scarlet fever, diphtheria, smallpox, or typhoid fever, should be wrapped in a cloth wet with a strong solution of chlorinated soda, or with "Standard Solution No. 1," or with zinc solution. The zinc solution should be made in proportions of one half pound of chloride of zinc to one gallon of water, or:—Water, one gallon; sulphate of zinc, eight ounces; common salt, four ounces.

TEMPORARY SHELTER DURING DISINFECTION.

Disinfection of a room always necessitates vacating it, and sometimes makes it impossible to remain in adjoining rooms, therefore in some cases it seems essential to have hospital, tent, or other temporary shelter for the inmates of infected houses, where bathing, disinfection, and washing can be done while such houses are being disinfected and put in order. On this subject local boards of health should be consulted, and should be prepared to act.

DISINFECTION OF ROOMS.

After a death or recovery from a dangerous communicable disease the room in which there has been a case of such disease whether fatal or not, should, with all its contents, be thoroughly disinfected by strong fumes of burning sulphur.

Rooms to be disinfected by sulphurous fumes must be vacated by persons, but the contents should all remain for disinfection. For a room ten feet square at least three pounds of sulphur should be used; for larger rooms proportionately increased quantities, at the rate of three pounds for each one thousand cubic feet of air-space.

Hang up and spread out as much as possible all blankets and other articles to be disinfected; turn pockets in clothing inside out, and otherwise facilitate the access of the sulphurous fumes to all infected places.

Close the room tight, place the sulphur in iron pots or pans which will not

leak, supported upon bricks over a sheet of zinc or in a tub containing water, so that in case melted sulphur should leak out of the pot the floor may not be burned; set the sulphur on fire by hot coals or with the aid of a spoonful of alcohol lighted by a match; be careful not to breathe the fumes of the burning sulphur, and when certain the sulphur is burning well leave the room, close the door, and allow the room to be closed for twenty-four hours.

The privy should be disinfected by fumes of burning sulphur.

It is especially important that the *contents* of the privy be disinfected. For this purpose use four ounces of the best quality of "chloride of lime" to each gallon of material in the vault.

DISCUSSION.

Dr. S. P. Duffield, Health Officer of Detroit: The principles laid down in the paper can be carried out in small places, but in large cities their enforcement would require a large force of men.*

The ladies are the ones who interfere most with the carrying out of sanitary regulations in Detroit. If placards are placed on the houses, visitors are kept away and the doctor is dismissed. Another physician is engaged, then another, until one is found who will take the sign down. Sanitary science missionaries are needed to teach that there must be care for one's neighbor's children as well as for one's own. With the ladies supporting us in this matter we can make great strides. The physician is the keystone of the arch of sanitary science. Ladies ought not to importune the family physician to order a danger placard down, but sustain his advice in every possible way.

Dr. E. B. Ward, Laingsburg: The persistency with which the contagium of scarlet fever remains in old clothes is remarkable. A family in which there had been cases of malignant scarlatina left some dolls and other things with which the children had played when sick, in the garret. Three years after the property was sold. Shortly after the three children of the purchaser were taken down with scarlatina. They had found and played with the things which had been left in the garret.

Dr. Henry B. Baker, Lansing: From facts which we have collected regarding scarlet fever, the general principle may be derived that there is very much more danger of the spread of the disease in winter than in summer. The disease causes many more deaths in winter in this state than in warm weather. A case of scarlet fever may occur in summer and not spread, yet when winter

* [While it is true, as Dr. Duffield says, that the proper enforcement of correct principles for the restriction and prevention of the dangerous communicable diseases in cities, where intercommunication between all classes of citizens is so close and constant, would require a large force of men, it is most emphatically true that in the interests of common humanity large forces of men should be employed; and until they are employed we must expect to have the reports to the State Board of Health continue to state, in response to the question, "what was the source of the dangerous disease?" that "it came from Detroit," or "it came from Kalamazoo," or from some other large city, and give the names and dates to prove the assertion. For many years it has been noticed that outbreaks of contagious diseases in country places in Michigan near a large city have been reported to have originated from a first case or from infected articles brought from that large city. This is probably in part because of the reasons stated by Dr. Duffield—namely, the greater amount of work required in a large city to properly restrict communicable diseases. But it ought not to be expected that the health department in a large city can perform its duties with only two or three officials. The proposition is ridiculous. The population of Detroit is estimated at 200,000, which is probable nearly one-tenth of the population of the state, and outside of Detroit there are nearly fifteen hundred (1,487) local boards of health, each having a president and clerk and members, and over twelve hundred (1,257) health officers, most of whom are physicians, whose duties are to guard the public health in their respective localities. If Detroit were to employ one-tenth as many health officers there would be 126, mostly physicians, saying nothing of the other officers and employes of the local boards in the country and smaller cities and villages. These officers are not constantly employed, but whenever an outbreak of a dangerous disease occurs they are employed.

It is manifest that, compared with the country and smaller cities and villages, the provision for work for the protection of the public health is very inadequate in our largest cities.—HENRY B. BAKER, *Sec. S. B. of H.*]

comes the disease may be spread by clothing or other articles which have remained without disinfection.

Dr. A. R. Ball, Corunna, spoke of the prevention of the scales, in which the contagium is, from getting into the atmosphere, by anointing the patient's body with oil or some fatty matter, as for instance a bacon rind.

Dr. B. S. Knapp, Owosso: People as a rule are opposed to being quarantined, and it is especially difficult to keep them quarantined during the period of convalescence. They are not awake to the danger themselves and don't see why other people should keep away from their house. The danger days of convalescence should be carefully provided for.

Second Session—Tuesday, November 22, at 7 P. M.

The session was opened by the reading of a paper by H. D. Bartholomew, C. E., of Lansing, on the disposal of waste in Owosso by sewerage and otherwise. Before beginning his paper the author stated that it was taken for granted that his audience were convinced of the necessity of sewerage, and were acquainted with the main benefits to be derived therefrom. Some interesting diagrams, showing different forms of sewers, etc., were exhibited.

DISPOSAL OF WASTE IN OWOSSO BY SEWERAGE AND OTHERWISE.

BY H. D. BARTHOLOMEW, C. E., LANSING.

Waste follows all change, all action, all life. If its product is not duly removed or disposed of, it multiplies itself, to the destruction of the object that is subject to its operation. The action of one natural law can best be met and controlled by the action of another. Vegetables and animals live in a measure upon each others waste. Damascus, the oldest city of the world, owes her longevity, in the opinion of many, to the balance between her plant and human life. Her meanest hovel is in the midst of plants, vegetables and trees. Our modern civilization crowds human beings together like bees in a hive—hence our spring cleanings, scavengers, dry conservancy systems, and sewerage by water-carriage.

From a general view we will turn to the special case in hand. The first study of the sewer engineer should be of the topography of the district in detail. Levels should be taken from the lowest spot to the highest on every street and alley in the district and a map made with contour lines drawn for every five feet variation in elevation. In the intersections of all streets or streets and alleys the height above datum should be given. This datum in practice is usually the elevation of the lowest point in the district increased by 100, so that all elevations within the district shall be plus. The scale of the map should not be less than 200 feet to one inch. Bench-marks or elevations of the water-table or door-step of your school house, brick or stone churches and prominent corners that are not liable to wear or change in elevation should be recorded. With such a map, the engineer could easily show the city fathers where a sewer would do the best work.

The next study should be of the annual rainfall. If no record has been kept for a series of years within the district those nearest at hand should be consulted. From the State Board of Health, Agricultural College, and other places where records have been kept we know that the rainfall is about 30 inches, more or less, for the southern and central part of the state. What does that mean? It means that on an average over 550 gallons of water fall daily on every quarter acre city lot. If the fall was uniform the problem would be simple, but it varies from 3½ to 129 inches in a year in different localities, and in the same place from year to year and from month to month. The severest rain-storm in the upper lake region, whose record I have seen, was .97 of an inch of rain in seven minutes, a full complement for twelve ordinary days. The question for the engineer to decide is, will he admit any, or all, or only a certain amount of rain into his sewers?

In connection with the rain-fall the geological character of the soil should be studied. Will it readily absorb the rain? Is the subsoil surcharged with water so that cellars are damp or wet and must be drained? Is the quantity of water in the soil sufficient to affect the cost of digging the trench and laying the sewer?

The next object of study should be the present and prospective population of the district; to determine the quantity of sewage to be provided for, and also what proportion of cost should be borne by the present generation and what should be left for the next. The amount of sewage allowed for each person, including waste water from kitchen and laundry, is from 30 to 40 gallons per day, usually put at 5 cubic feet or 37½ gallons, one-half of which reaches the sewer between 9 a. m., and 5 p. m.

In this connection the water-supply should be considered. Very few water works supply less than 50 gallons per day to each inhabitant, and very few over 100 gallons, where manufactories do not swell the amount. From 75 to 100 gallons per day is a safe basis. I prefer the larger amount.

Another material point, is the present sanitary condition of the district and the sanitary appliances in use. On this will depend in a great measure, the proportion of those who will avail themselves of the benefits of a good sewer system, or will oppose it.

The last, but not the least important, point to be studied in a general way, is the position of the outfall or mouth of the sewer. When that is decided, the rest of the scheme may be proceeded with at once.

On the 14th instant, a level was run from the bed of the river at Oliver street bridge, near the west line of the city, east to Saginaw street, thence south to the river; also one from the corner of Oliver and Ball streets south and west across the river to the R. R. junction. In about 600 feet from the river, Oliver street rises over 30 feet and does not apparently sink below that level, except at the second ward school house where it sinks some lower, to the eastern limit of the city. The highest point in the street is the west line of the school house lot which is over 40 feet. The bed of the river south of Saginaw street is 9 feet higher than at Oliver street bridge, a distance of one mile and ninety rods as nearly as it can be scaled from the map. The elevation on the west and south side of the river is less than on the other, being only from 22 to 24 feet above river bed at Oliver street bridge.

In connection with taking the level the general topography of the city was noticed and the map of the county studied.

Owosso is situated at the angle of Shiawassee river where it changes its westerly course for a northern one. To the north and east is a high plateau with little if any surplus subsoil water. To the south and west it is lower, somewhat swampy and requires underdrainage which has been given, in a measure at least, by deepening the creek, its natural outlet.

From the map it will at once be seen that Owosso is near the dividing line for the waters between Saginaw bay and Lake Michigan, as the Maple river a tributary of the Grand emptying at Grand Haven lies only 3 or 4 miles south and west. Let me here say that to-day I have visited what is called Hopkins pond and believe that it causes, in a measure, the surplus water in the neighborhood of the R. R. junction, but would prefer waiting for further facts before saying what may be the best drainage system for Owosso.

From the foregoing general principles and facts we wish to deduce a few controlling points which must influence the disposal of sewage in Owosso by water carriage without referring to the needs of her neighbors.

Where a district lies on both sides of a river it must be divided into two districts or we shall have an entirely different problem from a district lying entirely on one side of a stream. Fortunately for Owosso her mill-dam is gone and the bed of the stream 100 feet wide is only covered by 4 or 6 inches of water during the summer months.

By laying the main sewer a few inches below the bed of the stream all the buildings on the flats can be well sewered without any danger of their being flooded by the high level sewers, in flood time. To prevent this trouble, Boston, London and many other cities, have built large and costly structures known as intercepting sewers.

The river bed as stated has a fall of 9 feet in one mile and ninety rods which gives a fall of 1 in 750. The smallest sized egg-shaped sewer for that fall advised by Latham is 14 x 21 which will discharge, when flowing full, 192 cubic feet per minute. Is this large enough for Owosso? Let us say Owosso has grown to 15,000 inhabitants and every one man, woman and child deposits 37½ gallons or 5 cubic feet of sewage in the sewers each day. This gives 75,000 cubic feet per day, and one-half in eight hours gives only a trifle over 78 cubic feet per minute.

There is no provision made here for rainfall, as on the west and north side they can best dispose of it by keeping it above ground, and on the south and west side I have learned to-day that I need more facts before advising.

One word as to the best form of sewer. If the sewers always ran full, a circle would be the best form, but we wish for a form that will carry a small quantity as well as a large one, for this reason, that, when the flow is the least during the dry months of summer, disease is most prevalent and most virulent.

The law we are searching for is expressed by these words: Fluids flow most readily when their wet perimeter bears the least proportion to their bulk. To illustrate: Your river the past dry season was 100 feet wide and four inches deep. A tile 6½ feet in diameter would carry that quantity, and its wet perimeter or circumference in this case would be 20 feet and five inches. Your river's wet perimeter was 100 feet of air above and 100 feet of rough ground below, full ten times as much as the tile. The egg shape sewer with small end down, preserves this proportion under a variable flow of water the best of any form that has been experimented with.

Another point would be gained by locating the sewer in the bed of the

river with a gate at the upper end, so that it could be flushed daily, if necessary, during the dry season.

The laterals should be of six inch vitrified fire clay pipe, and the greatest care will be required to prevent the workmen from giving them too sharp a grade. They should never have a greater fall than one in 36, nor less than one in 292. The work will be better if the limits are one in 50, and one in 200. The carrying capacity of a six inch sewer within the last named limits varies from 28¾ cubic feet to 60 per minute, or the sewage of 5,500 to 11,000 people. Man holes or lamp holes should be made at every angle in the sewer or variation in grade, and many claim that they should never be over 400 feet apart. The sewers should be in the center of the street and the man holes in the center of street intersections. Iron steps should be built in the walls so that it may be easy to inspect the sewers, and the iron covers should be raised a little above the level of the street to keep out the wash, and perforated freely to act as ventilators.

All traps should be thoroughly ventilated at both ends. The inner one up through the water closets and roof, and the outer one a gas pipe up higher than the top of the chimney. I consider traps as a make shift, whose real work is too often merely to hide danger. I am fully convinced that a perfect sewer should have no traps, except to prevent cold draughts, but should be kept clean and sweet by proper washing and aeration or ventilation. In this connection I would refer to a paper by John Honeyman, lately read before the Sanitary Institute of Great Britian. He says facts now seem to prove that aerobian microbes are destroyed, or at least their virulence is so attenuated as to be harmless, as well as sewer gas, by proper aeration. He would do away with all traps and build all sewers egg shaped, leaving the upper larger part for the circulation of air.

The cost and the manner of distributing this cost among the taxpayers should be a special study, carried on in the district to be sewered, as all general rules must give way to the difficulties of each case.

Lansing and Grand Rapids, during 1886, built brick sewers varying in size from 24″x36″ to 40″x52″ at from $2.77 to $3.11 per lineal foot. As the largest size that should be thought of in Owosso ought not to be over 20″x30″, and the excavation is but light, I should put the cost at from $2.25 to $2.50 per lineal foot. If the bed of the river should furnish sufficient earth free from stone to protect the tile it would be much cheaper than brick. The cost of 6-inch lateral sewers with all the necessary man holes and lampholes should not exceed 50 or 60 cents per lineal foot.

The most difficult point of all is to so assess the cost that the taxpayers will acknowledge that the burden falls where it ought. There is no question but that all main sewers should be paid for by the whole district. The laterals or sub-districts cause the most trouble. It is usual for the corporation to pay a part, from one-tenth to one-fourth, of the cost, the balance to be distributed among the taxpayers who can avail themselves of that particular lateral, according to benefits received or receivable. The benefits received cannot be gauged by the assessed wealth of the tax-payers, as it benefits the poor man as much as it does the rich. The basis of families will not do, as many lots whose value is enhanced by the presence of the sewer have no houses or families on them, and again a sewer is just as necessary for a family of two as for a family of ten. The number of lots will not do, as they are not all of a size, and some may be subdivided and others not. Neither will the size be

a just criterion, as a large garden back of the house receives no benefit from the sewer. Some base their assessment on the frontage scaled by the distance from the sewer; others claim that a variation of 10 feet or less in frontage, unless it varies the number of building sites, should not affect the assessment. Lately, an engineer has proposed dividing the amount assessable, charging six-tenths upon the frontage, corner lots to be reckoned only as to their length, and four-tenths upon the area, both to be scaled by the distance from the sewer.

Whatever course is adopted, it should be like the laws of the Medes and Persians, irrevocable, until the entire district is well sewered.

I have not spoken of any other method of sewerage than water carriage, as no other method has been reduced to a system that deals with large or growing towns.

When our legislature shall, directly, or by the Board of Supervisors, forbid the discharge of sewage into any running stream in this state, then our inland cities will dispose of their sewage otherwise, by the dry conservancy system, earth closets, pail or tub system, or they will treat their sewage with chemicals until they can discharge it into the stream as innocuous.

The dry earth-closets have done good service in isolated cases, as have each of the many other systems that we see advertised, when they are in the hands of painstaking enthusiasts; but they all lack what the water carriage system has, a powerful natural agent, to do most of their work for them.

The one part on which nearly all our patent systems rest is our inward filthiness, our desire to appear clean without taking the trouble and labor to make ourselves and our surroundings really clean. We forget that sewer-gas and disease germs in general are both odorless and tasteless, while the bad odor that so frightens us is merely mother nature, otherwise nature's God plainly telling us that we are not clean.

There is one infallible test of a good sewer system, as regards the public health, and that is, does it prevent any and all contamination of the water-supply of the district? If it does, then the list of the cases of diseases caused by sewer-gas and the microbes from the sewer will appear very small, at the last end of the catalogue of prevailing diseases published by the State Board of Health, in the place of the thousand cases of typhoid and other fevers that appear at the head of the column, caused by an impure water-supply.

DISCUSSION.

Dr. C. P. Parkill, Owosso: Would not the sewage of the city poured into the river contaminate it for the people along its banks?

Mr. Bartholomew: In general terms the Shiawasse river here is larger than the Grand at Jackson, and there the sewage is emptied into the river. The bottom of the river is the safest place for the sewer, as the force of floods is not felt so much there as at the sides. The bottom of a stream is seldom eroded.

Dr. S. P. Duffield: The more I ponder the question of sewerage in inland towns which have but small water capacity flowing from them, the more herculean does the task of the removal of sewage seem. Berlin, with its immense population, has adopted the pumping system. The sewage is forced to a height and then carried away in ditches over large fields, called irrigation fields. The sewage taken up promotes the growth of grass, etc., but I found the fields damp, and the question arises whether some day or other an epidemic may not arise. If Owosso and Corunna drain into the Shiawassee, complaint will arise that the river has been made a sewer. The question of the pollution of rivers is a grave one. But the greatest intricacies surround the problem of great cities. "The Lord made the country and the devil made the city." It is the unnatural crowding of people

in cities which gives the sanitarians their hardest work. An excellent method of disposing of sewage is by burning it. Montreal has a large furnace for this purpose and pays $42,000 a year to burn up garbage and other waste material from the vaults. Before deciding to pollute the Shiawassee the advice of the best sanitary engineers should be obtained. The question of a pure water-supply is going to be a harder one than that of the disposal of sewage.

Dr C. McCormick, of Owosso, then read a paper on the sanitary condition of the Owosso school buildings and grounds.

SANITARY CONDITION OF OWOSSO SCHOOL BUILDINGS AND GROUNDS.

BY C. MC'CORMICK, M. D., OF OWOSSO.

The Owosso schools are the pride and glory of Owosso citizens, and the education of her children is regarded as one of her primal duties. As evidence of the correctness of this statement note the readiness with which the taxpayers vote annually large sums of money in order to provide suitable accommodations, appliances and instructors for the proper education of her 1,500 children. For this purpose five brick and two frame school buildings are utilized, twenty-five teachers are employed and a good average amount of educational appliances, such as Kindergarten supplies, maps, globes, chemical and physical apparatus is provided. In return for their liberality, the people have reason to expect, and a right to demand good healthful vigorous school work.

This can only be accommplished under good sanitary conditions, and sanitary science can boast of no grander triumphs than to secure life and health to the "rising generation." Knowledge is power and wealth, and the noblest capital of the nation is in the intelligence and physical strength of its people. To reduce then, the death rate at the very sources of our national existence, to round out a cultivated sound mind in a strong and sound body is the work of the educator and the sanitarian. With a view of eliciting how far Owosso has done her duty in this respect, and how nearly we approximate to the standard of our present knowledge of school sanitation, I have been asked to prepare this paper. The principal points to be compassed then, in this investigation, are (1) School Buildings, their location, environment, and construction, how heated, ventilated and lighted, (2) Teachers, pupils, and parents,—their food, clothing, moral and social surroundings.

SCHOOL BUILDINGS.

The school buildings in the city are constructed of brick. (Three are outside of the city, although in the district.)

THE CENTRAL BUILDING.

The central building was erected in those days when less was known by architects and builders of the sanitary needs of such buildings than at present; when imposing massiveness, and expensiveness, overshadowed every

other consideration, because ministering to the vanity of the people. This building has nine class-rooms, with their necessary cloak-rooms, four recitation-rooms, with a chemical laboratory and eating-rooms in the basement. From the ground to the third floor there are fifty-eight steps which have to be climbed. When you add to this climbing day after day, that, necessary to attend recitations, it aggregates an amount which, in my judgment, is a fruitful source of physical mischief, especially to girls over fourteen years of age, —those just ripening into young womanhood. Headaches, backaches and aching limbs, all betokening functional derangement of important organs, which not only impairs their capacity for study, but also impairs physical health to such a degree as to render life burdensome and miserable. With a full knowledge of the fact that many of the evils resulting from piano practice, late suppers, dances and fashionable social gatherings, are often attributed to the schools, I unhesitatingly declare that the physical damage resulting from climbing and re-climbing three flights of stairs several times a day meets the physician with appalling frequency. I believe that the day is speedily coming when the good sense of this community will demand a high school on the ground floor,—when a new high school building will be erected on these same grounds with all necessary accommodations on the first floor.

FIRE PROTECTION.

The central building has wide halls, a straight stairway at each end, with wide and easy tread. The pupils are always marshalled from the building with military precision, and are so drilled in this particular that in response to a given signal, the building can be completely emptied in three minutes without confusion, the pupils taking their effects with them. This is our best fire protection.

LIGHTS.

By a rearrangement of seats the light is perhaps as good as is usually obtained in buildings of this construction. The seats are so arranged that the light comes mostly from the rear and over the pupil's left shoulder. Its volume is controlled by means of shutters and blinds. The proper adjustment of natural light and its abundant admission is a matter of very great importance for the care of the visual organs, particularly in the prevention of myopia. No pupil in the room is more than 22 feet distant from a window.

HEATING AND VENTILATION.

This building is heated by four large furnaces, each having a separate smoke-flue or chimney. The rooms are kept at a uniform temperature of 70° F. as nearly as may be. But the proper ventilation of the class rooms has been a matter of study and considerable anxiety to the school board during the past two years. Much has been done to improve it—much more needs to be done still. The only ventilation the architect designed was through cold air flues—that is flues not in any way connected with chimneys or otherwise heated surfaces. The result has been that instead of carrying out the cold and foul air from the rooms, they frequently reverse the draft and pour cold air into the rooms.

THE WARD SCHOOLS.

The Ward schools, being of more modern construction are two story, four room buildings, heated by furnaces, having large chimneys 16 x 48, with a smoke flue 8½ inches in diameter in the center, thus heating the whole interior of the chimney causing an upward current or draft. Into these chimneys the classrooms are all ventilated through a 16 x 24 register and the result although not perfect is very satisfactory. The class-rooms in the buildings will average about 12,500 cubic feet of air space. This for a class of 50 pupils would allow an air space of 250 cubic feet, which I think is sufficient. Allowing 1,500 cubic feet per head per hour would necessitate an entire change of air in those rooms every 10 minuets. Does our ventilation accomplish this?

Analysis of common air shows an average of about 4 parts of carbonic acid gas in 10,000. Good health requires that the Co_2 should not exceed 6 parts in 10,000. This is seldom attained in school rooms. Analyses of 39 rooms in Boston by W. R. Nichols showed Co_2 15.6 parts in 10,000. R. C. Kedzie analysed the air of 46 school rooms and found 22.9 parts in 10,000 and the air of 17 rooms by H. Edman of New York gave 20.8 parts in 10,000. The deduction is that school rooms as a rule are very imperfectly ventilated and if we keep the proportion of Co_2 below 10 parts in 10,000 the ventilation may be considered fair. Although Co_2 is poisonous, yet it is not the chief noxious agent, and in quantities usually found in school rooms is not of itself specially dangerous. Its estimation however, fairly represents the relative degree of organic pollution. The organic impurities arising from animal vapors from the bodies, emanations from the lungs, skin and filthy clothing of pupils produce the most dangerous contaminations of the atmosphere of the school room. The process of diluting and dispersing this contaminated atmosphere by the introduction of pure warm air constitutes the problem of ventilation. This should always be accomplished by some system without creating drafts. The more fresh air that can be so admitted the better. In cold weather, windows and outside doors should never be opened for ventilating purposes, as they cause dangerous drafts of cold air to fall upon the heads, necks and backs of the pupils.

This pernicious practice has been productive of much physical mischief. Catarrh, congestions, bronchitis, pneumonia, otitis, tonsilitis and rheumatism are common results of such exposure, and we know that these diseases, not only produce a vast amount of suffering, but often terminate fatally.

LOCATION AND ENVIRONMENT.

Our school buildings are very happily located, the sites selected being on natural elevations of ground, thus affording ample opportunity for drainage. They are isolated and sufficiently far removed from factories, saloons, stables and the business portion of the city to secure both quiet and cleanliness. The water-supply is good, being taken from deep drive wells on the grounds in each instance. Analysis show them to be free from organic impurities and to be good potable waters.

The play-grounds are ample, that at the central building comprising about three and one-half acres, and at each of the ward schools one and one-quarter acres. On these grounds the sexes are kept separate. We have nothing as

yet in the way of gymnasia. One objection to the school grounds, particularly at the central building, is a superfluity of shade trees. They keep the grounds too shady and consequently at certain seasons too damp. The school board recognizing the fact that a neat, orderly and attractive environment is in itself educational in its influence, and begets habits of cleanliness, order and neatness in the pupils, always seeks to keep the school grounds orderly and clean.

PRIVIES.

The privies are constructed on the dry-earth system, viz.: A water-tight vault as a receptacle for the dejections. Dry earth, unslacked lime, ashes and saw dust are variously used as absorbents. Copperas is principally used as a disinfectant at a strength of about one and one-half pounds to the gallon of water. The contents are frequently removed to prevent any considerable accumulation. The walls and floors are kept clean and free from dirt, disfiguring marks and scratches, by carefully watching and disciplining the pupils, and the frequent use of paint brush and plane.

TEACHERS, PUPILS AND PARENTS.

With reference to the second division of my subject I must of necessity be brief.—Teachers should be men and women of unquestionable moral character, of broad and liberal minds and sound judgment. Besides being able to tell when and by whom were fought the battles of Issus and Arbela; that the product of the sum and difference of two numbers is equal to the difference of their squares; that the verb, to be, has the same case after it which it has before it; that the exports of Uruguay are hides and tallow, and such kindred knowledge as will enable them to successfully pass a board of county examiner's examination, besides all this they should have a special preparation for their work.

Theirs is an important responsibility. To them is committed the task not only of teaching "the young idea how to shoot" but also of caring for the physical heal th of their pupils for a period reaching over twelve or fourteen years—the perilous, formative period of manhood and womanhood. Hence they should have a knowledge of the laws of human life and the science upon which these laws are based, such as anatomy, physiology, psychology, hygiene and sanitary science. They have to deal largely with both human mind and body and should understand the laws which govern each. We seek to employ such teachers, and flatter ourselves that we are successful sometimes. At any rate we believe that we have as noble and faithful a corps of teachers—men and women—as can be found in any school anywhere.

Pupils I think as a rule begin school life too young, and my convictions are that often too much is required of them. The physical and mental development should be symmetrical and harmonious, the latter should never be allowed to imperil the former. Our school is on the University list and our curriculum corresponds therewith. Physiology, hygiene, physics and chemistry form an important part of the instruction. Our High-school being the only one in the State receiving credit at the University for work done in chemistry.

Our city is not yet so large that we have many *very* poor in it, very few parents too poor to comfortably clothe and feed their children. Dirty hands

and faces, unkempt hair and dirty clothing are not seen in the school-room. Lewdness and obscenity are carefully guarded against. Pupils are expected and required to be affable and kind in their demeanor. The sick and those coming from homes where contagious or infectious diseases are prevailing are rigidly excluded from the schools.

Parents often expect too much of teachers. They ought ever to remember that the highest and best school is the home. If germs of immorality, insubordination and disease are there allowed to germinate and grow, teachers can do but comparatively little to eradicate them. Parents are apt to hold school-life and school-work responsible for many evils which result from their own neglect or mismanagment.

Thus, ladies and gentlemen, is Owosso doing its school-work, and certainly no other public work is of more anxious interest or of more vital importance to every family in the city.

DISCUSSION.

Dr. E. H. Bailey, Corunna: Many diseases are caused or aggravated by continued stair-climbing, yet a remedy for the trouble is hard to find.

The age at which children are to be introduced to school is sometimes put down to seven years, but this is too low. Eight or nine, and in some cases, ten years is not too high an age.

Dr. S. P. Duffield, in response to question: The ventilation system known as the "Smead," as used in Detroit, is not a perfect system. It takes its air in from the lowest point. The best place from which to take air is on a level with the story ventilated. The ventilation system the Smeads have placed in the schools is vastly better than the old systems. A system might be adopted, however, and one not patented, which would be vastly better than those in common use. Mr. Smead deserves credit. The Detroit Board of Education is now awakened to the importance of ventilation. But the Smead system might allow of the carrying of disease germs into the rooms. If a system of drying closets is to be adopted it should be placed outside of the school buildings proper, in order that the reversal of draughts may be avoided. A current of air may often be reversed by opening a window. Drinking cups and water should not be in the rooms where closets are.

Dr. E. B. Ward: The present sanitary condition of affairs in the Owosso schools, indicated in the paper read, can not but be considered admirable, and Owosso has reason to be proud of her schools.

Mr. E. R. Brewer, Owosso: Much credit for the existing order is due the State Board of Health. The people were educated by the Board's influence in many ways, and the local health board, taking the cue from the State Board, made vital changes.

Third Session—Wednesday, November 23, at 9:30 A. M.

Prayer was offered by Rev. C. B. Spencer, of Owosso. Then followed Dr. Ward's paper on clothing.

CLOTHING.

BY DR. E. B. WARD, LAINGSBURG.

(Dr. Ward's paper is necessarily omitted from the proceedings of the convention, as it has not been received at the office of the Secretary of the State Board of Health.)

DISCUSSION.

Hon. Jerome W. Turner, Owosso: The christian church has been responsible for much of the insignificance in which the body of man has been held in the past. If we read history aright we find that the best men we ever had were men physically strong. Not half as much injury is done by the wearing of improper clothing as is generally attributed to that habit.

Dr. E. L. Shurly, Detroit: The danger of deformity is due to the fact that the changes usually take place slowly. The body can be deformed by slow degrees and yet live. To compare civilized women with aborigines is unfair. The drudgery and overwork must be taken into account. Corsets will cause deformity if too tight. I have seen on post-mortem tables subjects in which there were ridges through the liver caused by tight corsets. Many affections of the heart are caused by tight lacing. Light dressing for parties or other evening entertainments is productive of more injury than corsets are. The person goes from a tropical climate to a cold one or gets in a cold current of air. Influenza or catarrh may not follow, but organs may have been displaced and abdominal diseases may result. Too much cannot be said to mothers and to young girls about this light dressing. The skin can be inured against cold. The mother may begin by giving the child a warm bath in the morning and by degrees making it colder until cold water is used. Then dress with light clothing about the chest and heavy about the legs. Chest protectors are pernicious. The protector gets the skin in the worst possible condition to resist cold currents. Business men sit in over-heated offices and then rush out in the cold. The clothing should be light in the warm house and then heavier worn outside of the house. Seal skin sacks are to be welcomed as a blessing. Unsanitary clothing is the cause of much of the ill-feeling ascribed to overwork or biliousness. In the houses in which our fore-fathers lived the doors and windows were seldom tight fitting. In many of those houses paupers would be unwilling to live to-day. Yet the people who did live in them were generally healthy. They suffered less from cold and catarrh, diseases now alarmingly prevalent.

Dr. Haverfield, Petoskey: In comparing civilized women with uncivilized, the brain and feet ought to be considered as well as the waist. A lady's dress to-day is regulated by the fancy of the gentlemen, and it is the latter who are at fault if ladies do not dress according to sanitary laws. If twenty-five ladies and twenty-five gentlemen were taken from the audience and anatomically examined, the ladies would be found less deformed and generally more healthy than the men.

Dr. H. B. Baker: The danger from fire which accompanies certain kinds of clothing should be emphasized. Women who have to work over stoves, or, who are liable to come in contact with fire should dress in light flannel instead of in cotton. Many lives would be saved each year. This is especially important with reference to children.

This discussion was followed by a paper on impure drinking water as a factor in the causation of disease, read by Dr. J. A. Wessinger, of Howell.

IMPURE DRINKING WATER AS A FACTOR IN THE CAUSATION OF DISEASE.

BY J. A. WESSINGER, M. D., HOWELL.

A learned medical writer has said that "When one looks back over the fields of scientific research, he cannot but be impressed with the marvelous progress which has been made within the past few years, much of which has contributed both directly and indirectly to the enrichment of our own profession. To no two departments is this more applicable than to those of chemistry and biology. Less than half a century ago all that was definitely known of chemistry could be included within the pages of an ordinary text-book; but so vast have become the fields of exploration, so complete and diverse the subjects for study, and so numerous and zealous the investigators who have appeared of late, that even the chemical specialist is overwhelmed and discouraged and must content himself with merely a synopsis of the general science." While it behooves us to drink deep at the fountain of scientific knowledge, acquaint ourselves with many of nature's subtleties and unravel

and analyze her wonderful and intricate machinery, while we thus are wont to go to the very borderland of the unknown and unknowable, we should not lose sight of the fact that all around us and in our very midst are yet many things that demand our most serious attention. Our domain may be invaded by a most relentless and insidious foe. We love to think about and philosophize upon the "ptomaines" and "leucomaines," "sepsine" and the bacillus tuberculosis. While we observe the movements and life history of these, we should not lose sight of the fact that there is a bacillus malariæ a typhoid bacillus and certain grosser organisms that may and often do occur in the very drink and food that constitute our daily portion, which by their presence bring about the most serious changes in the animal economy. These, indeed, may be the very fuel that sets in motion the fire that burns to death the consumptive, the scrofulous, or even the robust. I am led to believe that improper drink and food have very largely to do with the deleterious changes that we so often see wrought out in the bodies of our fellow-men. Having thus briefly alluded to the subject for our consideration, I will not weary you with lengthy and intricate theoretical concepts, but will simply state the proposition—that impure drinking water is a causative factor of disease, and with a series of practical observations based upon a somewhat extensive and careful study of the subject I hope to demonstrate to you the truth of my proposition as stated above.

On Sept. 17, 1886, I was called to the residence of Mr. G. to see his little eight-year-old daughter. I found her suffering with malignant diphtheria. The girl died on the fifth day of her illness. I was at a loss to know the origin of the disease. It had not prevailed in the town and the girl had not been away from home. The people are wealthy, and the dwelling-house, large and commodious, stands on an eminence at the outskirts of our city. I began a sanitary investigation of the premises. Everything bore a strict scrutiny until I came to the drinking water. Here I found that the family had been in the habit of using water from a well located in the barn. This well is 25 feet in depth. There is another well just at the rear of the dwelling. I made an analysis of the water which the family had been using and found in it large quantities of organic nitrites (.04 gr. per U. S. gal.). Any farther use of the water was prohibited. The family have not used it since, and a good state of health has prevailed among the members up to the present writing. It might be well to mention at this point that about six months previous to the outbreak of diphtheria two members of the family were very sick with typhoid fever.

In January, 1885, diphtheria occurred in a family at Fleming six miles west of Howell. The people are living in a large commodious house with surroundings as good as those of the average farmer. Diphtheria raged in this family on three different occasions within one year and eight months. During the last outbreak in which one of the children died, I began an investigation of the place to ascertain if possible the cause of the prevalence of the disease in this particular house. All the surroundings bore a careful scrutiny until I came to the well. This I found located under the front stoop, open, and about twenty-five feet in depth. The water was brought to the surface by means of a chain-pump. The water contained a whitish sediment, and a chemical analysis revealed organic nitrates and nitrites. A microscopical examination of the water brought out an organism somewhat similar in outline to the gonium pectorale of some biologists. Any farther

use of the water was prohibited, and no illness has prevailed in the family since.

On July 2d, 1887, Mr. B. brought a sample of drinking-water from his well, for analysis. He informed me that three members of his family were taken quite sick during the night. Violent retching and vomiting, followed by fever, were the prominent symptoms. He also told me that he believed the water to be contaminated and the cause of the trouble.

I made an analysis and found organic nitrites (.01 gr. per U. S. gal.) I went to the home of Mr. B, and began an investigation. I found the well about 35 feet in depth. The privy about 60 feet away contained closets and was kept perfectly clean. Sixty feet in the opposite direction from the well, is one of the main sewers of the town. The well is just on the brink of a hill, and the sewer in a valley about twenty feet below the level of the hill. This sewer I found was not only used to convey surface water, but had been tapped at six different points for the purpose of draining dish water, wash water, and other slops into it. In the valley or ravine, above mentioned, the sewer pipe was found disjointed, and the earth all about this point, saturated with filth, emitted a most fœted odor.

You will notice that in this instance the bottom of the well or the water-bearing stratum was only 15 feet below this surface filth, and hence its contamination from this source. The use of this water was prohibited, the sewer repaired, and no sickness has prevailed in this family since. It might be worthy of note to say also that a neighboring family who had been using this water were taken sick at about the same time and with the same vomiting, retching and fever, as in the previous instance. Mr. B. the only one out of seven to escape, had been in the habit of drinking the water after boiling. Previous to this contamination I had analyzed this water and found it pure.

The fourth and last instance that I wish to relate to you is about as follows: Two years ago last March a retired farmer, together with his family, came to our town to reside. The dwelling in which the family took up their abode is large and commodious, with all modern improvements. The well is open, with a wooden pump, 15 feet in depth, and contains six feet of water. The soil about this well is sandy. The source of pollution is an under drain which empties into the ground within fifteen feet of the well. On analysis this water was found to contain 112 grains of solid residue per gallon, and also well marked traces of organic nitrites, (.06 gr. per U. S. gal.) The family used this water about one year; during this time the husband and wife were almost constantly suffering from gastro-intestinal disturbances in one form or another. The three children of the family went through about the same experience. The hired girl, after being in the family about three months, came down with a severe form of typhoid fever. The girl recovered after an illness of about five week's duration. I now strongly advised the family to change their dwelling place. They returned to their farm and none of them have been ill since. Having thus given you a few, out of many, similar instances, that I might relate to you, I feel warranted in saying that impure drinking water is a causative factor of disease, and also that the truth of the proposition with which we started out has been made evident. Finally let me say to you that no element in nature has been more lavishly distributed than water, and none is more essential to the animal mechanism; it enters every tissue; we find it in every fibril; it is present

in all the ultimate cellular structures. It is as free as the air we breathe. Then, as we get it free, let us be sure that we get it pure; as you move the handle of the pump be sure that you know

"That the essence of purity flows,
That life unto life shall be given."

It is often stated that water must be wholesome because we see no ill effects from its use. In answer to this I would say that we cannot expect to find the effect of impure water always sudden and violent. The results of the continued imbibition of polluted water are indeed often gradual, and may elude ordinary observation, yet be not the less real and appreciable on a closer inquiry. In fact it is only when striking and violent effects are produced that public attention is arrested; the minor and more insidious, but not less certain evils, are borne with the indifference and apathy of custom. I am aware that there are those who teach that surface filth does not contaminate the soil farther than from two to three metres from its focus; but I believe we have the clinical evidence that will destroy all of this. I need hardly refer you to a well-known instance that happened at the city of Lapeer. Here we have good evidence that several persons contracted typhoid fever from drinking water contaminated by percolation through the soil of the excreta of a typhoid fever patient.

There are those who lay great stress upon the quantitative estimation of organic nitrates, nitrites and albuminoid ammonia present in drinking water. The thought seems to be prevalent that the development of disease germs depends upon the quantity of food supplied. We claim, however, that a qualitative estimation of these principals is just as important, since if the requisite food is present, it matters very little in what quantity, the germ grows and developes, and when this organism enters the body, pathological changes are very liable to follow. To us it is sufficient to find these nitrites and albuminoids present in water to render it suspicious and even dangerous; and we believe we can furnish the clinical evidence with which to substantiate this claim.

My friends, every opportunity for tracing an outbreak of disease to its presumably preventable cause is precious to the sanitarian. It speaks more loudly than mere words can to the public ear, which he desires to reach. Almost every hamlet and almost every home in our beautifnl land have been stricken with some one or more of the fatal diseases, and who shall say that much of this has not been caused by our own negligence. I fear it is not a difficult task to read a homily from the little white headstones which mark the new-made graves in the beautiful cemeteries scattered all over this broad domain. Neither does it require a great stretch of the imagination to hear the leaves whispering together in the night wind a sad requiem over those little mounds, scarce green with the grass of their first summer. A responsibility comes in at this point, and we should see to it that our drink and our food, as well as our homes, are pure.

DISCUSSION.

Dr. Hal C. Wyman, Detroit: Fifteen years ago I saw thirteen people out of twenty-one die with typhoid fever. A well was the cause of the disease. It contained all manner of refuse. A great many wells to-day are unfit for use. Examinations should be made, if the well has been in use any great length of time, and if found impure, other water should be used even if one is obliged to go a mile for it. The recommendation to use boiled water should be emphasized. There are facilities in every house for boiling water.

Fourth Session—Wednesday, November 23d, at 2 P. M.

Dr. A. M. Hume, of Owosso, read the first paper. His subject was, "Work of the Local Board of Health."

WORK OF THE LOCAL BOARD OF HEALTH.

BY A. M. HUME, M. D., OWOSSO.

What is health? Webster tells us that it is "the state of being hale, sound and whole in body, mind or soul," and we may go further and say that soundness and wholeness of body, mind *and* soul is but the type of *perfect* health. Public health then means the perfection of public morality, the ultimate point in public education and the acme of physical well-being of all mankind. By a strict interpretation of law then, the local boards of health are the conservators of the mental, moral and physical beings of their people—being at once or by turns teachers, preachers and physicians—almost a hydra-headed monstrosity, if not monster. In this triple capacity all the educational work in the universe is the field of operations of the local board of health, that is from a legal standpoint. But I protest, and as an humble member of a local board of health call for a division of labor. My theological friend, we do not wish to usurp your rights. Endeavor to teach your people that a clean body and a pure mind are the only proper companions for a godly soul. You, Professor, do not need us in your field when you instruct your pupils that an educated mind can progress toward perfection only as it is attended by physical and spiritual right living. Then you, my professional brother in medicine, can show the physically perfect beings in this coming millenium how so many of their corporeal ills were but the results of mental and moral abnormalities. But this millenium has not come, and the local board of health must yet plod along, here by force of law removing the deadly cesspool or vault whose owner can not or will not be taught that therein lies *danger*, not to his neighbors alone but to himself and his own family; there excluding the public from the house which shelters the case of contagious disease, the householder more often than otherwise declaring that "as long as I'm not afraid of this they needn't scare everybody else to death"; and from every quarter receiving the credit (?) of doing all sorts of foolish things in the interest of "red-tape," nothing more. And what is our reward (exclusive of the salary which some of us do not get)? For years and years the cannibals of the South Sea Islands and other places too numerous to mention satisfied the cravings of their carnivorous appetites by appropriating for that purpose the physical beings of their late respected friends and teachers, the missionaries. Out of this human sacrifice has come the saving of many souls. So may the roasted but untoasted member of the local board of health feel that perchance from his funeral pyre there may arise an influence which may bear health, wealth and prosperity to a community. Leaving this pessimistic view of our work, let us deal with the matter in its other and perhaps pleasanter aspects. Public laws are effective only as they are supported by public sentiment, and the wisest and best of sanitary regulations can never be suc-

cessfully enforced unless given force by the will of the people. Therfore, let all seek to know and understand the laws of health, and knowing what is right strive to do the same. Because the board of health declares my neighbor's vault a nuisance and injurious to the public health, does not convince him that such is a fact; and though he may remove it under compulsion or fear of law, nothing but education can convince him of the justice of such measures. And how shall education be obtained? The board of health should be, and I believe usually is, a willing teacher. This teacher may be a poor one, but if so let those anxious to learn seek knowledge from other and perhaps better sources, but just as easily reached, and in that way become an enlightened community as regards sanitation. Such a community has no need of a board of health, for each person becomes a maker of correct sanitary laws for himself.

There are two laws which if observed would fulfill nearly all the moral and physical requirements for perfect sanitation. The first is "Be just." The position of a householder is only one of many in which a man is expected to act with reference to the good of others as well as of himself. It is not just nor fair to say to your neighbor "I shall arrange my premises to suit myself and you can look out for yourself," and then place your pig-sty, barn, refuse, etc., on the back part or side of your lot, disagreeably if not dangerously near his house. In such a case should you demur because the local board of health listens to his complaint and compels you to remove the danger which you have placed in your neighbors way? Then again, when you complain of the foul cess-pool or vault on your neighbors premises, do not think it unfair that the board of health, finding cess-pool or vault even more filthy upon *your* premises, should call upon you to first "cast out the mote," etc. Further, do not claim that, because you have made some needed changes in vault, drain, or sewer, and every resident of your ward has not been compelled to go and do likewise, therefore the board of health does not amount to anything. We admire *you* for what you have done, and by patient, constant urging, and the aid of your good example, we hope in time to elevate your neighbors to your high level as a sanitary reformer.

The next law is "Be clean." First learn how to be clean by learning how to get pure water, pure air, and pure food: and right here come the duties of women as sanitarians. The board of health do not like to come prowling around your back kitchen doors like tramps, but is there not often need of inspection there? Mother Earth may kindly absorb all the slops and garbage thrown out there, but who can tell how much of disease and perhaps death she returns to you in the form of noxious air and vapors or contaminated water? A damp cellar filled with decaying fruits and vegetables may be unknown to your local board of health, but too often the family physician is called to try to undo the damage, which a little extra care or a few cents worth of lime might have prevented. Pure air and sunlight entering those dark long-closed rooms for even a few minutes every day would remove that dampness, and the many germs of disease which may be lurking there. No greater charge could be given a woman than the sanitary regulation of her own house, for there are laid the foundations of the future physical, mental and moral lives of her children, In the country and in our smaller towns and cities we are not exposed to the dangers which in large cities arise from the overcrowding, poverty and ignorance of certain classes of their population; therefore let every householder and every mistress of the house, every father

and every mother in the city of Owosso study how to get pure air to breathe, pure food to eat, pure water to drink and proper clothing to wear. Then with 1,000 healthy homes and 2,000 vigilant health officers we shall be able to show in our better selves and our strong-bodied, pure-minded, clean-souled children the true "Work of the Local Board of Health."

DISCUSSION.

Dr. J. A. Wessinger: It is the duty of the local board of health to see that the people live up to sanitary laws, and that the laws are enforced. To this end the board must have stamina. Too often the members of the board are under the control of politicians and are afraid lest they injure themselves. But they ought to do their duty. Many people throw slops on the ground through ignorance. The earth will take up part of the slops, but it is only a question of time when it will be saturated and the well become contaminated. One remedy is to scatter the slops over a large surface of ground. The local board should see that these things are looked after. Cess-pools and vaults also require attention. Citizens should be ready to abide by the rulings of the health board, without caviling.

Dr. E. L. Shurly: Every local board ought to be chary about introducing innovations. It is often necessary to wait until the community is educated up to where the work can be readily executed. There is no difficulty in enforcing sanitary regulations about small-pox, because the people appreciate the danger. But the subjects of plumbing and sewerage have not yet been thoroughly understood, and they are subjects which must be handled carefully. Public laundries may need investigation. Clothes are often not sufficiently heated or washed, and the germs of disease may not have been destroyed. Local boards should investigate the baths in barber shops.

Dr. A. R. Ball: Local boards should insist that proper drainage be provided regardless of political influences. In the rural districts heedless disposition of house slops is the cause of much of the sickness.

Dr. H. B. Baker: About a half-dozen diseases cause more deaths than all the others put together. Consumption heads the list; it is not so easily prevented as some of the others, but this disease can be lessened, and, in general, it is practicable to prevent the others. The local boards can carry out the law if the people coöperate with them. In 1886, out of 324 outbreaks of scarlet fever in Michigan the health officers could say on oath that in only fifty-eight was the law carried out relative to the isolation of patients and the disinfection of the rooms, clothing, etc. In 461 outbreaks of diphtheria the law on these subjects was fully carried out in only 116. In those outbreaks in which the law was not carried out there were five times as many cases and five times as many deaths as there were in those outbreaks in which it was fulfilled.

Hon. Jerome W. Turner: The local boards should see that bad places are cleaned up. I know of a house in this town surrounded with filth. The pigs run about the door, and green scum stands on pools of water close by. The children are uncared for, yet seem ruddy and strong. How is this to be explained?

Dr. E. B. Ward: Nastiness of itself does not cause typhoid fever. But when the infection of that disease comes, it takes hold where the nastiness is. People may use impure water, or be surrounded by filth, for years, and not seemingly be the worse; but when typhoid fever comes, they are the ones most likely to get the disease.

Mrs. Dr. Haverfield: Put women on your local boards and you'll have practice, and not theory alone.

Dr. H. B. Baker, in reply to a question: The best method of disinfection, after death or recovery in scarlet fever and diphtheria cases, is to subject the sick-room and all contents to the fumes of burning sulphur. Every article of furniture, pictures, etc., should be left without moving. Burn three pounds of the sulphur to each 1,000 cubic feet of air-space. In typhoid fever the discharges from the bowels should be disinfected by the use of chloride of lime—about an ounce of the powder at a time, or a quart of a solution made by adding four ounces of the powder to a gallon of soft water.

Dr. S. P. Duffield: When treating or moving a small-pox patient I wear a long duster or rubber coat, and on returning home wash my beard and hands and face in a mixture of two parts corrosive sublimate to 1,000 parts cologne. The contagium clings to woolen goods and to

the hair. I have used the above solution as a disinfectant in two cases of gangrenous diphtheria, spraying the room. I am satisfied that the infection was thoroughly killed. As there is a possibility of re-infection in cases like the two mentioned, it is well to use a spray of the solution.

Dr. E. L. Shurly: Small-pox is most highly contagious, but contact is required. Scarlet fever is highly infectious by means of both animate and inanimate things. Small-pox poison is a more palpable poison. What the scarlet fever and diphtheria poisons really are is not so generally known. If a person remains with the patient any length of time, and especially as a nurse, the clothing should be disinfected.

Dr. Hal C. Wyman: The lack of attention to spoons used in examining children's throats often leads to trouble. Parents put a spoon in one child's mouth, and finding white spots straightway use the same spoon in examining the throats of the other children. The spoon should be changed, and thoroughly cleansed after each examination.

H. D. Bartholomew, in reply to question: The only proper kind of drain for disposal of house slops is a drain run along just below the surface of the ground, and cleaned frequently—relaid each year.

At the close of this discussion, Dr. Hal C. Wyman spoke on house-building from a surgeon's standpoint.

HOUSE-BUILDING FROM A SURGEON'S STANDPOINT.

BY HAL C. WYMAN, M. S., M. D., PROFESSOR OF SURGERY, MICHIGAN COLLEGE OF MEDICINE AND SURGERY, MEMBER OF MICHIGAN STATE BOARD OF CORRECTIONS AND CHARITIES, DETROIT.

The title selected for this paper is perhaps a little ambiguous. I wanted to describe some of the things found about badly-constructed houses which interfere with the health and happiness of the inmates by causing something besides malaria. Everybody talks about malaria, until the word is made to represent so many human ills that it is difficult to assign it any scientific meaning. For one I would like a change, after having heard the varied use of the word for many years, and think it must be possible that other diseases have their origin in faulty dwellings. One case of hipjoint disease, which I think is often caused by bad stairways, represents a larger sum of human suffering in the two to ten years commonly comprised in its course, then twenty cases of the varied and uncertain malady known as malaria. I have wearied of the constant ding dong about sewerage and ventilation, and desire to hear discussion about something besides traps, drains, fans, shafts, flues and closets. When we consider the immense influence which accidents have upon our death-rate, we see the need of something to diminish their number. The American Public Health Association has endeavored, by means of prize essays, to popularize means for the prevention of accidents in large manufacturing institutions. Rules for the care of injured persons and lectures to employes of railways have told how and what to do for the aid of the wounded before the arrival of the surgeon, but much of the information set forth in that way may be summed up in the answer of the medical student who, when asked during his final examination for the doctor's degree what he would do in case he was called to attend a man with a bleeding artery, said he would run like blazes for a doctor.

STAIRS.

For these implied reasons I wish first to speak of stairs, because they are in many instances the source of accident and serious disease. Often the stairways are too steep, the tread being too narrow and the rise too high, and persons are consequently quite likely to fall. The ideal stair would be represented by a tread double the width of the rise; that is, a tread twelve inches wide would have a rise six inches high. In former years, when ceilings were low, houses not infrequently contained stairways with a tread of twelve inches and a rise of five; but such a step to our unaccustomed feet is not easy and therefore not always safe. Children suffer more frequently than adults from defective stairs. The not uncommon picture is presented of a mother or some guardian member of the family leading a little one of two to five years down a stairway, holding on to the little hand, with the arm extended above the head; the stairway steep, the rise perhaps seven or eight inches and the tread not a whit wider. The little one, with his weight half suspended, suddenly drops upon one hip in such a way as to bring the full weight of the body upon that part. This act being repeated as many times as there are steps in the stairs, gives us one of the surest means of producing the dread calamity known as hip-joint disease. When we think of the extreme frailty of the hip joint in these little ones, how the bones of the hip are not yet firmly united together, we appreciate how necessary it is that the weight of the superimposed structures should be evenly distributed over both hips and all the tissues composing the joints, in order to avoid one part being subjected to more strain than another, and in consequence more likely to become the seat of the disease.

That portion of the tread of a stairway which projects over the rise and is known as the nosing often projects too far, so that in ascending, old persons, whose muscular sense has become impaired by age, are very likely to stumble and fall, frequently producing fracture of the hip or other portions of the body. My own experience in accidents resulting from this cause embraces several cases of fracture of the neck of the femur, occurring in persons over sixty years of age, not one of whom has ever been able to use the limb with anything like comfort or facility.

The light of stairways is often bad. For some reason builders find it convenient oftentimes to put the stairway in the darkest portion of the house, and for the purpose of economizing space, not infrequently, stairways that are dark make sharp turns, which are still darker and which are veritable pitfalls to those ascending and descending who are not, by the experience of several falls, familiar with their location. The turn in such stairways usually embraces a series of steps which are much narrower at one end than at the other and consequently have a tread varying in width in the same step, so that, in the darkness, a person unaccustomed to them is quite certain to make false steps and fall. Innumerable bruises, wounds of the scalp, abrasions of the face, fractures of the jaw, of the leg, of the arm and of the thigh have in my experience resulted from this cause. The turning point in stairs of the character just described should have ample illumination by a window.

The rail and newel-post of stairways should always be of sufficient strength to perform the purpose for which they are intended, namely to provide a grasping place and to sustain the weight of any person ascending or descending the stairway and to serve as a life rope in cases of falls, or stumbles

resulting from unpreventable causes. The fact that children and the younger members of the family are sometimes disposed to use the banister as a toboggan slide, and that they often meet with accident by falling to the floor or striking against the newel-post, would make it appear advisable to have the stairway rail constructed in such a manner as to make sliding on it impossible.

The head room in stairways is often insufficient, and tall persons descending such stairways many times receive serious injuries of the head or spine by striking their heads. The writer has known one rather tall lady to get a serious disease of the bones of the neck which will cripple her for life, by striking her head while ascending one of these narrow stairways with insufficient head room. The tendency among housebuilders of the last generation to get as much space as possible between floor and ceiling has led to the erection of steep and unsafe stairways of the kind just mentioned. Oftentimes the length and breadth of rooms is less than the hight and such a plan necessarily imposes steep stairs, with narrow treads, high rises and low head room. No doubt the hight between floor and ceiling is largely for the purpose of increasing the quantity of air contained in the rooms; but we should not lose sight of the fact that in the endeavor to secure plenty of fresh air by this means we may impose upon the inmates of the house greater dangers from accidents upon steep and badly constructed stairways than would naturally result from breathing the air of rooms of lesser height,

Stairways that are much frequented by children ought, I think, to be covered with thick pads and carpet, the latter securely fastened with strong nails to prevent its catching or tangling the feet, because children are very apt to stumble and strike upon stairways in such a way as to produce concussion of the spine, which often bruises the cartilages between the bones of the spine, and lays the foundation for most serious disease and deformity. If the force of such falls is broken by striking upon something soft, like the pads just mentioned, dangers of this kind would be greatly diminished.

These measures to many may seem extreme; but anyone who has ever seen a case of Potts' disease of the spine, who has noticed the gradual loss of strength, the constant pain, the sleepless nights, the peevish cry, and who has seen the sharp angular curvature of the spine which follows, the fever and the sweats and the puss from deep-seated absesses, and who has watched over the little one and helped him to use the crutches, the braces or the casts, which the surgeon has devised for the purpose of mitigating the disease and preventing the dreadful curvature and deformity of the spine, cannot find fault with any measure, no matter how elaborate or expensive, which gives promise of diminishing any of the accidents which are likely to be followed by this disease.

FLOORS.

The floors of houses are not always as they should be to give the minimum number of accidents. Unevenness of surface provokes falls which require the the services of the surgeon to make bodily repairs. Different rooms sometimes have floors of different hights. A very common defect in the ordinary houses of Michigan and the north and west is found in having a difference in the hight of the floors of the kitchen and dining or sitting room. The L portion or the annex to that part of the house commonly known as the upright, usually contains the kitchen and the rooms in which much of the female labor of the domestic establishment is formed. This very com-

monly is six or eight inches, sometimes a foot or more lower than the adjacent or upright portion of the house, which in many instances will contain the dining-room and will be constantly visited by the women who are working in the lower portion of the house, making it necessary for them in the ordinary pursuit of their labors to step up and down this place innumerable times every day. It is not necessary for me to speak of the various accidents and injuries which result to women from this cause. They must be apparent to every one who will for a moment think of the amount of muscular effort which is necessary to lift the body innumerable times every day to the hight represented by the step or steps indicated. I know of no reason why this difference in the hight of floors between the two portions of the house should be so common; but if you will take the pains to notice you will find that one-half of the houses being erected to-day in this city will contain the very defect mentioned. Another matter which concerns the floors of houses is that of nailing a board upon them varying in thickness from a half inch to an inch and a half under every door, known as a threshold. This relic of barbarism, which has occasioned more broken heads and noses than all the shillalahs of old Ireland is happily quite uniformly left out of modern houses; but it is still found often enough to keep the wolf from the surgeon's door and should be torn out without further delay. Its purpose originally, I presume, was to compensate for any imperfection in a nice work of door hanging and door framing, which only skilled carpenters can do. Without the threshold, the door-post and the hangings must be perfectly perpendicular, else the door rubs upon the floor and is not easily moved. But there is no excuse for such imperfections in these days of skilled mechanics.

New floors sometimes contain ragged boards which sliver easily. I have known several accidents of a serious nature to result from this cause. Striking the bare feet against them, they penetrate and wound the foot. Children playing and sliding or creeping as they often do, upon the floor, have had these splinters of wood driven not only deeply into the skin but even into the joints, like the knee and ankle, setting up most serious disease.

WINDOWS.

The windows of houses are a constant menace to the fingers, hands and heads of those persons who find it necessary to raise and lower them. The frequent want of perfect fixing apparatus for holding the sash to prevent its falling has led to many fractures and in some instances to amputations of the fingers and hands The weights that are attached to sashes and run inside the frames to serve as a counterpoise should be carefully constructed. Defects here may be very often the source of accident. The person lowering the window, not knowing that the rope is broken, pulls out the stick or lifts the catch with one hand resting on the window sill, and suddenly finds the sash descending like a guillotine, crushing the hand or fingers beneath it. I have known the head to be cut and the deep tissues of the neck seriously bruised by imperfections in the window fixtures. The fastenings by which the windows are secured when closed, or held when opened, should be maintained in perfect working order and should be of a kind that rarely gets out of order. The haste with which people sometimes endeavor to lower or raise a window at the approach of storms, or for other reasons, leads them to grasp these fastenings violently, and to exert such an amount of force that, when the

fastenings do not yield readily, the fingers are often badly torn, and felons and abscesses of the tendons and bones of the fingers and hands result.

DOORS.

The keys, bolts and knobs, the fastenings of doors should be in perfect, easy working order. A bolt which refuses to slide or a knob that hesitates to turn or a key that rubs and chafes in the lock may cripple and wound the hand that pushes or turns it. Felons are very often caused by defects in these articles. Too much force is put upon the recreant bolt and the soft structures overlying the bones of the finger or hand become injured, bruised or broken. Inflamation and abscess follow, giving rise to a felon or palmer abscess. The former often leaves a finger ruined for life, the latter freqently leaves the hand useless by contracting all its tendons, pulling the fingers in upon the palm and distorting it out of shapeliness and usefulness. Knobs are set too near the door edge, so that in opening the door the fingers are caught and bruised against the door frame. Springs are sometimes put upon doors to make them shut automatically. They are in some cases too strong and drive the doors to with such force that the children and weaker members of the family are unable to hold them. Serious bruises and crushed fingers and toes have been thus caused.

GAS-FIXTURES.

Gas-fixtures on the walls are very commonly projected at a point so low that they are an imminent source of danger to any one groping his way in the dark. They are usually about five feet from the floor, project eight to twelve inches from the wall, are often surmounted by sharp prongs which hold a globe, that is sometimes in fragments, and are located at just the right hight to strike the face, eyes, ears and neck, causing dangerous hemorrhages and making frightful scars which sometimes disfigure for life, and have been known to blind.

The chandelier depending from the center piece is oftentimes so low that the heads of members ef the household strike against it. On one occasion the writer had a little patient whose head had been thrust against one of these chandeliers by a fond uncle, whose delight it was to catch up the little one and toss him as high as he could with probable safety. Not noticing that he stood beneath the chandelier, the baby was tossed upward, striking its head against one of the projecting prongs, whose only apparent purpose was to hang jumping-jacks and toys upon. A very serious wound of the head was produced. The habit of tossing babies into the air has perhaps very little to do with house building, but if the male members of a family can not show their appreciation of the little ones in any other way, architects and builders ought to place the chandeliers high enough to be beyond the reach of disasters of the kind just mentioned.

CELLAR DOORS, ETC.

Hatchways into cellars should be protected by railings when open. One man let his mother-in-law fall down the cellar stairway and was very properly sentenced for life for attempted murder. The stairs leading to cellars should

be carefully guarded. The frequency of accidents in this part of the house makes the need of protection of this kind quite apparent.

A great many accidents in houses are caused by falling plaster. One of the lost arts seems to be that of making plaster. For some reason the plasterer entrusts the most delicate and essential portion of his art to the least skilled of his kind. The cheapest laborer mixes the plaster and it is not strange that the proportions of lime and sand—of calcium and silicic acid—are not evenly and properly mixed, to insure a good, firm setting plaster, and, in consequence, it sometimes falls crashing on the heads of people, occasioning a large variety of surgical injuries. The hair which should enter into the plaster is sometimes of inferior quality, too short and brittle, diminishing the tenacity of the key which projects through the lath and laps over, holding the plaster securely in position. The quality of lime, of sand, of hair, and of labor, are factors which enter into the manufacture of plaster, which, if not properly observed and carried out, make a poor article, that falls from the walls at the most inopportune moments, occasioning the maiming and even death of those who may be beneath it.

Chimneys, when not built of proper materials, so that the bricks are held firmly together, become a source of danger to people about houses. High winds dislodge any loose bricks which may be about, fracturing the heads of people with whom they come in contact.

Roofs with loose boards, rafters, tiles, slates or iron railings upon them, should have all these articles removed or securely fastened. The force of winds upon roofs is difficult to calculate and too much pains cannot be taken to guard against any of the articles mentioned being blown off and falling upon the heads of people who may be passing. In cities and villages accidents from this cause are numerous.

It has not been my intention to mention all of the defects which exist in houses, and which are responsible for many of the scars, crooked limbs, distorted spines and sickly bodies of our fellow men; but to mention a few of the more glaring evils which are most easily remedied.

Fifth Session—Wednesday, November 23, at 7 P. M.

The fifth and last session of the convention was opened by Dr. S. P. Duffield, who presented the pro and con of the "Pasteur Method."

THE PRO AND CON OF PASTEUR'S METHOD FOR HYDROPHOBIA.

BY S. P. DUFFIELD, PH. D., M. D., HEALTH OFFICER OF DETROIT.

In November, 1886, Pasteur communicated to the Academy of Science at Paris the results of his much heard of method for protection from hydrophobia after being bitten by a rabid animal. During the one year which had elapsed since he gave his first communication to the Academy (October 26, 1885,) 2,490 persons supposed to have been bitten by mad dogs were treated

by his method. The treatment of each was uniform, lasting always ten days, during which time a daily injection into the cellular tissue was made of an infusion of the spinal cord of a rabbit which had died of rabies (paralytic), beginning with a cord of fourteen days old or exposure, and ending with one of five days. He classifies his patients according to their nationality. It is interesting to note that, as might be expected, the majority (about two-thirds) were French, 80 were English and 21 were Americans. Many cases came from remote parts of Europe.

Out of 1,726 French and Algerian cases inoculated, ten died of hydrophobia.

The following table shows the countries sending the patients and the number from each.

France and Algiers	1,726	America	18
Russia	191	Holland	14
Italy	165	Greece	10
Spain	107	Germany	9
England	80	Turkey	7
Belgium	57	Brazil	3
Austria and Hungary	52	English India	2
Portugal	25	Switzerland	2
Roumania	22		

This equals 2,490, the number already given. The 1,726 gave a mortality of ten, which equals one in every 172.

During the five years preceding November, 1885, the number of deaths from hydrophobia in the hospitals of Paris was on an average twelve per year. During the year ending November, 1886, there have only been three deaths, and in two of these the patients had not previously been treated by Pasteur's method. Pasteur believes then that these results confirmed the utility of his method. He afterwards found it necessary to modify his method in cases of patients bitten in the face or head, or bitten very severely elsewhere, especially if the parts bitten were naked. This he does by passing more rapidly than usual and with omissions through the injection of the graded cords until a spinal cord of one day old is reached. Finally, in order to meet the objection which has been raised to the experiments on dogs, on which his method is based, that the dogs were inoculated *before* being bitten, whereas the men were inoculated *after* they had been bitten, Pasteur has made some fresh experiments on dogs, in which he practiced intercranial injection with fresh virus (unmitigated) and then inoculated them afterward in the usual way. These experiments were evidently not very successful, hydrophobia appearing in most of them. Pasteur concludes with the remark that the immunity conferred by inoculation previous to infection offers best proof of the excellence of the method. The same holds true of small-pox, for who would hope to save a small-pox patient by vaccination after the disease has appeared? His method may be given as follows:

M. Pasteur found, when a portion of the spinal cord of a dog, which had died of rabies, was injected beneath the dura mater of a rabbit, the animal became infected with rabies at the end of fifteen days. The spinal cord of this rabbit was found to contain the virus of hydrophobia its entire length. A portion of this spinal cord after removal, with antiseptic precautions, is

placed in a wide-mouth jar, or better, hung from the lid, fused caustic potassa being first placed in the bottom of the jar so as to insure dryness of the air in the jar. This cord under these circumstances gradually loses it virulence until it entirely disappears, at a rate proportionate to the lowness of the temperature.

Thus, spinal cords are used which have been kept different periods of time, and a "bouillon" prepared from each, which can be injected under the skin. M. Pasteur's experiments were of a necessity at first confined to lower animals, and the two or three persons who were first successfully inoculated could not be considered as affording sufficient proof of the value of the treatment.

About this time M. Henry Rochefort, who as an editor is never happy except when attacking some one in his paper, printed a sensational paragraph that a child which had been bitten by a mad dog, was placed by the parents in the hospital, and asserted that she had lost her life from the hydrophobia virus injected by Pasteur, not from the bite of the dog. He vouched for the correctness of this statement, defying Pasteur to disprove it. It turned out, however, that he did what no *scientific* investigator should have allowed himself to do, viz., for the sake of a sensation he did not state the truth. This little girl had met with the accident *six weeks* before she was brought to Pasteur, and the dreaded malady had had time to develop into the direst form of hydrophobia, before the protection by inoculation could act, that is by the attenuated virus. I will have occasion further on to speak of the stronger virus, or, as he calls it, the intensive method. In 1886, on May 1, Pasteur gave his report of 726 persons, including those then under treatment. Of this number 38 were bitten by wolves (rabid), and 688 were bitten by rabid dogs. Those bitten by the dogs were at the time of the report doing well, with the exception of the little girl Pellitier just mentioned. Of those bitten by wolves at the time of the report, May 1, 1886, three died hydrophobic, and the rest were under treatment.

At that time, May 1, 1886, M. Pasteur makes the following statement: "As yet it is impossible to foresee what may happen to them" (those bitten by wolves). He then called attention to the fact that:

First—The duration of incubation of rabies in the human being caused by the bite of a rabid wolf is very often short, much shorter than hydrophobia after the bite of a rabid dog.

Second—That the mortality of the wolf bite is greater than the dog bite.

This may be explained to a certain extent by the number, depth, and the seat of the wound or wounds. The wolf always attacks his victims savagely, the attack being very often, we might say generally, upon the head and face. The necropsy of the three Russians who died at Hotel Dieu, and the inoculations of rabbits, guinea pigs and dogs with sections of the medulla oblongata (portion of base of brain) of the first Russian who died, prove that the virus of the wolf and dog are sensibly of the same degree of virulence and that the difference of the rabies of the wolf and dog, depend on the number, nature, and extent of the lacerations. Based upon this view Pasteur sought to modify his method in wolf bites by making a greater number of inoculations in a shorter time.

The main difficulty seemed to him to lie in the length of time consumed in the journey from Russia to France, during which time the virus was incubating in the wound. Russians from Smolensk, were six days on their jour-

ney to Paris, and from the time of their being bitten and their arrival at the Laboratory at Paris, 14 days had elapsed.

It is here proper to state that Pasteur claimed that many who had been inoculated could die because there was a certain mean of *latent incubation time,* (I use an English translation of the German expression) and that the inoculation might not keep pace with the incubation of the rabic virus. Within this year this "latent incubation" or latenz zeit of the Germans has been studied for wolves' bites by Dr. O. du Mesnil, of Vincennes. Over 98 cases of "wolf bitten" cases showed a "latent time" as follows: *

Before 15 days	3 cases.	From 70—80 days	3 cases.
From 16–20 days	11 "	" 80—90 "	2 "
" 20–30 "	37 "	" 90–130 "	0 "
" 30–40 "	17 "	" 130–140 "	1 "
" 40–50 "	10 "	" 140–200 "	0 "
" 50–60 "	10 "	" 200–210 "	1 "
" 60–70 "	8 "		

From these data we can assume that the half of all the cases will sicken in one month, and that 90 per cent. by the end of the second month,—from wolf-bite. Dr. O. du Mesnil gives also statistics relative to time of sickening from dog's bites:

Before 15 days	8 cases.	From 80—90 days	15 cases.
From 16–20 days	6 "	" 90–120 "	11 "
" 20–30 "	24 "	" 120–150 "	6 "
" 30–40 "	26 "	" 150–180 "	4 "
" 40–50 "	29 "	" 180–210 "	0 "
" 50–60 "	19 "	" 210–240 "	3 "
" 60–70 "	11 "	A total of	117 cases.
" 70–80 "	9 "		

Here we have in one month only 22 per cent. sick, and at the end of two months only 65 per cent.

Dr. Ph. Bauer, a pupil of Bollinger's, in München, (Munich) has made some investigations on the time of incubation of rabic wounds that merit the thanks of the whole scientific world. He bases his calculations upon 510 cases of known time of incubation.

In 49 cases after wolf bite the *mean* incubation time was 39 days.

In 293 cases after dog bite it was 73 days. In 31 cases after "cat bite" it was 80 days. In eight per cent. of Bauer's cases the disease began on the 20th day, 58 per cent. of all cases came by the 60th day, and 18 per cent. came after the 100th day. From his results Dr. Bauer places the average time of incubation in children from 2–14 years of age, at only 57 days. In adults 70–77 days. The variation above can also be explained by the *position and character* of the wounds. In children the wounds are more apt to be in the face and head or neck. By older persons in the extremities. Dr. Bauer found the time of incubation from the different wounds which I herewith append as valuable for reference.

* From La rage des loups Annales d'hygiene Paris, 1886, October, 345 pg.

In 73 cases, wounds on head and neck—time of incubation, 55 days,
In 15 " " " other parts of trunk—time of incubation, 55 days.
In 17 " " " lower extremities—time of incubation, 74 days.
In 144 " " " upper " " " " 81 "

(*Münchener Med. Wochenschrift, 1886, N. N. 36-39.*)

Du Mesnil found, out of 342 cases of wolf bite, 260, or 60 per cent. of deaths from hydrophobia. Renault (according to Brouardel, *sur la rage in Dict. Encyclopedia de Science Medicale*) gives 164 fatal cases from 254 bitten, or 65 per cent. Vallet (according to du Mesnil) 265 fatal cases from 395 bitten, or 68 per cent., an average of 64½ per cent. According to Pasteur (*Academie des Science, Paris, 12 April, 1886,*) the per cent. of deaths is 82 from wolf bitten cases. We learn, therefore, that from 60–80 per cent. of those bitten by mad wolves die of hydrophobia. I will not weary you with statistics, and will quote but once more, this time from Oemler and Günther. Of 15 men bitten by a butcher's dog, which, while living freely on meat, became hydrophobic, 11 died, showing a death rate of 73 per cent. Most of these were bitten in the face and head.

And now comes the question as to the *efficiency* of the Pasteur treatment. The English committee estimated the value of this method in the following language :

"After the first few months in which M. Pasteur practised his treatment, he was occasionally obliged, *in order to quiet fears,* to inoculate persons who believed that they had been bitten by rabid animals, but could give no evidence of it."

The report continues:

Between October 1885, and the end of December 1886, M. Pasteur inoculated 2,682 persons. Of the whole number, at the rate of 5 per cent., at least *100 should have died.* Accepting the fact that the mortality on patients bitten by rabid animals *is* 5 per cent. we must deduct from the enormous number of 2,682 the persons who were treated *in order to quiet their fears.*

Even these credulous commissioners fail to show by sufficient proofs that all persons inoculated at the *Ecole Normale* had been bitten by rabid animals. The boast of the Pasteurians that all persons inoculated were in danger of death from hydrophobia should, after the above assertion, be condemned.

Dr. Lutand made frequent visits to Pasteur's institute and critically observed numbers of people attending, and they were not able to produce to him satisfactory proof that they had been bitten by rabid animals. They asserted that the dogs had been immediately killed or *were suspected.* In either case, the fact of rabies remained "not proven." But such was their fear, like my own patient, they ran to Pasteur to save their lives, and were placed on the list as hydrophobic thus enlarging the cures. At last being overcrowded and feeling somewhat the ridiculous position he was assuming before "Savants," Pasteur was obliged in defense of his method to establish categories among his patients. According to the statements published by the Anti-Rabic Laboratory, and accepted by the Commissioners, only 233 persons among the 2,682 were bitten by animals proved to be mad. The proportion of 5 per cent, is then to be taken not from the amplified sum of 2,682 patients, but from the real number 233 accepted by Pasteur himself. Now let us correct the report of the committee which says: "Taking as the lowest rate of mortality from the bite of rabid animals 5 per cent., the total number of

inoculated persons being 2,682 at least 130 should have died." Instead of which the real deduction from facts would be, taking as the lowest rate of mortality 5 per cent., the total number of persons bitten by rabid animals being 233 only 15 should have died. Now let us see how many did die after his treatment, during the period quoted by the committee, between October 1885 and December 1886. According to the tables the number of deaths during the above period were 43. M. Pasteur and commission say only 40. Accepting their figure as only 40 where is the benefit of the new treatment? For instead of 15 deaths which is the usual average we have 40! Twenty-five above the number that would have occurred had they been let alone.

The only true way to test any method of treatment is to compare the mortality before treatment and that resulting after treatment has been instituted. Only in this way can we arrive at the solution of the value of the treatment.

M. Tardieu, the eminent professor of forensic medicine at Paris for thirteen years prior to 1863, estimated from statistics and found the official returns of the annual mortality from hydrophobia in France to be 25 cases. Dr. Tardieu adds that this number, which was obtained from the French authorities of all departments and therefore as correct as possible to make it, ought to be widely known in order to neutralize the panic created from the popular belief that the cases are very frequent and almost all of those bitten die. Professor Brouardel, who now occupies Tardieu's chair in the Paris Faculty, gives as the annual mortality for France a total number of 30 cases. These figures show that rabies in France is rare in the human race. The statistics furnished by other countries are equally demonstrative:

In England and Wales, annual deaths from rabies, 43.

In Austria, annual deaths from rabies, 12.

In Prussia, where dogs are muzzled, annual deaths from rabies for the last five years have been 10, 6, 4, 1, and 0.

Remembering that for the last twenty years in France the annual average of deaths from hydrophobia was 30, we will now look for the annual death-rate of 1886, when Pasteur's method was in vogue. The table of deaths shows for France a total of 25 from hydrophobia *after* his treatment. If now we add to that number 17 deaths from rabies among the people who did not receive the treatment we obtain for the whole year a total of 42 deaths. Accepting 30 as the annual mortality we have an increase of 12 deaths, an excess over preceding years of 12 fatal cases.

It is evident that the death-rate has not been lowered by treatment instituted in 1886. On the contrary, the mortality has been increased. By looking over the deaths and the manner of death of the 25 fatal cases of Pasteur during the last month of the year 1886, *nine* died with the symptoms of paralytic rabies. If we assume that the increase of death was coincident with the application of his "intensive method" we arrive at but one conclusion, and that is that M. Pasteur has not been curing rabies, but that he has increased the mortality by exposing the patients, confiding themselves to his "intensive method," to death from paralytic rabies, such as occurs in the rabbit after injection of the *rabic* virus.

Those of you acquainted with his methods will remember, failing in his milder and more careful injections of a *modified* virus, he boldly applied what he called his intensive method, and the unfortunates died with the experi-

mental form such as we can produce in the rabbit (paralytic rabies). This was clearly illustrated in Goffi's case, which I now describe.

On the 4th of September he was bitten by a cat at the Brown institution. The wounds were immediately freely cauterized, and six hours later the wounded portions of the skin were excised at St. Thomas hospital. He was sent to Paris the same night, and on the following morning M. Pasteur commenced the "intensive *treatment*" and it was continued for 24 days. On the 10th of October he returned to his work and appeared to be in his usual health, but he became sick with pains in the abdomen like colic, and with pains in the back. On the 18th he had partial motor paralysis in the lower limbs, which are the symptoms we get in rabbits after injecting the virus (under their skin), but which *symptoms have never before been observed in man.* He grew worse and died on the 20th, completely paralyzed. To the last he was free from all the usual symptoms of hydrophobia and the progress of his disease and the manner of his death were similar to those of acute paralysis. But the certainty that his death was due to the virus of rabies is to my mind proven by Horsley's experiments. A portion of the dead man's spinal cord was made into an emulsion and a rabbit and a dog inoculated with it. Both died with characteristic paralytic rabies, such as occurs in rabbits, and which those who have experimented with the virus on rabbits readily recognize.

In most of the other cases after the intensive treatment the symptoms were nearly similar to the case above related. I think it is fair to come to the conclusion that there is at least a strong suspicion that the deaths after the intensive method point to the inoculations rather than the infection from the rabid animal. In plainer language Pasteur's method, and not the animal, was the cause of death. This may seem strong language, but when we take into consideration the table I give below of the intensive method and its results it can well be seen why we *fear* such a method.

In the death of Wilde we have the same symptoms and can truly, and I think fairly, make the same deductions. The supporters of Pasteur claimed that Wilde died of pneumonia; but the symptoms did not correspond to this. The report of the case and of the post-mortem examination, published in the Rotherham papers, showed a great resemblance to the paralytic symptoms manifested by Goffi and others. It is also claimed that pneumonia is an important symptom of the paralytic form of rabies, or hydrophobia. I shall use the term rabies for hydrophobia in the animal in contra-distinction to the term hydrophobia, which means the disease in man. The pneumonia is due to the paralysis of the bulba, the upper extremity of the spinal cord. The paralysis of the lungs has been noticed in all cases of paralytic rabies, and in paralytic hydrophobia. Accordingly, we feel the truth of Dr. Clarke's words: "It is almost impossible to avoid coming to the conclusion that nineteen inoculations with the spinal marrow of diseased rabbits were the cause of death of this unfortunate young man." The application to French subjects was equally pernicious and I will read you the results of the intensive method herewith appended.

M. PASTEUR'S HECATOMB.*

Patients Submitted to the Intensive Treatment.

Patients of M. Pasteur.	Locality.	Bitten By	Bitten On	First Inoculation.	Died of Hydrophobia.	Source of Information and Data.
			1886:	1886:	1886:	
Joseph Goffi, *alias* Smith..	Brown Institution, London.....	Cat	Sept. 4	Sept. 6	Oct. 20	"It is possible the death might be due to hydrophodia."—(Evidence of Dr. Mackenzie, *Pall Mall Gazette*, Oct. 23.)
Rovati, Luigi	Modena.....	Dog	Sep. 12	Sep. 20	Oct. 23	*Journal de Médecine de Paris*, March 13 (1887).
Clergeot-Moulin	Paris	Dog	Aug.	.....	Oct. 24	Died at the Tenon Hospital, Paris.
Edward, cabman.....	Versailles.....	Dog	.....	.....	Oct. 30	*Le Science Libre*, Paris, November 14.
Arthur Wilde.....	Rotherham.....	Man	.....	.....	Nov. 3	*Rotherham Advertiser*, November 6.
Lodini, B.....	Constantine	Dog	Oct. 12	Oct. 21	Nov. 24	Professor Peter (*Lancet*, January 15, 1887).
Rouyer, Arthur.....	58, Rue de Bretagne, Paris.....	Dog	Oct. 20	Oct. 21	Nov. 26	*Journal de Médecine de Paris*, December 5, 1886.
Leteng, père.....	Gourgeon	Dog	Nov. 3	Nov. 8	Dec. 8	Professor Peter (Letter to, from Dr. Pitoy).
Reveillac, Louis.....	France	Dog	Nov. 4	Nov. 6	Dec. 21	*Bulletin de l' Académie de Médecine*, Meeting of the 11th January.
Née, Leopold.....	Arras	Dog	Nov. 12	Nov. 17	Dec. 17	*Journal de Médecine de Paris*, January 2.
					1887:	
Jansen, Louis.....	Dunkirk	Dog	Aug. 19	Aug. 21	Jan. 1	Professor Peter (*Lancet*, January 15).
Gérard, Amédée.....	Boran (Oise).....	Dog	Dec. 1	Dec. 8	Jan. 3	Professor Peter (Letter to, from Medical Attendant).
Goriot, Paul.....	Paris.....	Cat	Nov. 30	Dec. 21	Jan. 14	Drs. Boisson and Dangats. *Journal de Médecine*, January 30.
Albert (woman).....	Vallouise (Basses Alpes).....	Dog	Dec. 20	Dec. 25	Jan. 5	Dr. Vagniat, of Briançon. *Journal de Médecine de Paris*, February 13.
Foulup	Tour du Pin (Isère).....	Dog	Dec. 1	Dec. 12	Jan. 24	*Journal de Médecine de Paris*, February 6.
Bergé.....	Bordeaux	Dog	Sept.	Sep. 12	Jan. 28	Dr. Pitres made the autopsy and declared that the man died of hydrophobia. *Journal de Médecine de Paris*, February 6.
Alphand (woman).....	Madeleine (Paris).....	Dog	Dec. 18	Dec. 20	Jan. 30	*Journal de Médecine de Paris*, March 13.
Saintes (child).....	Maison-Carree, near Alger.....	Dog	.....	.....	Feb. 24	*Journal de Médecine de Paris*, March 13.
Chavagnac, Louise.....	Arbe	Dog	Oct.	Oct.	Mar. 10	*Journal de Médecine de Paris*, March 20 and July 31. Dr. Dujardin Beaumetz. [Died while under treatment.]
Sans Ramon.....	La Sirena, Badajoz, Spain.....	Wolf	Feb. 15	Mar. 15	Mar. 20	
Ballasteros.....	La Puerta, Prov. of Jena, Spain....	Dog	Feb. 9	Feb. 20	Mar. 24	
A person (no name given)..	Navas de San Juan (Jena), Spain..	Dog	.....	.....	Mar. 26	*El Resumen*, a Spanish journal, quoted in *Journ. de Médecine de Paris*, April 24.
A woman.....	Baeza, Spain.....	Dog	.....	.....	Apr. 23	
Ph. Hydram.....	Sallèle, France.....	Dog	Oct. 5	Oct. 10	Apr. 17	*Lancet*, June 4, Paris Correspondence.
J. Hayden.....	Thurles, Ireland.....	Dog	Apr. 16	Apr. 19	May 19	*Lancet*, June 4, and *Freeman's Journal*, Dublin, May 27.
Doneraile, Lord.....	Doneraile Court, co. Cork, Ireland.	Fox	Jan. 14	Jan. 26	Aug. 26	*Times*, August 27. *Journal de Médecine de Paris*, September 4.
Pénichaud	Poulaines (Indre), France.....	Dog	June 12	June 14	Aug. 19	Dr. Bretheau (Valençay, Indre), in *Journal de Médecine de Paris*, September 4.

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During the last three months of 1886, the intensive method was applied in its most active form. Here are the results. Nine individuals probably not affected with hydrophobia, for we have no positive proof of the dogs being mad, submitted to this dangerous treatment, and died as the rabbits die when inoculated with rabies, *i. e.*, from paralytic hydrophobia. I give for want of time, one case which can be taken as typical of the nine cases. The observation was made by Professor Germeeerme of Arras, and communicated to the Academy of medicine at Paris by Professor Peter.

A man named Née, aged 42, a basket maker, was travling in the country with a little cart under which was a dog. On November 12, 1886, near Aresnes-lecomto he let his dog loose and was immeditaly bitten in the right leg. He seized the dog, tied him up and killed him. The dog had never ceased taking food and the postmortem examination made at Arras by a veterinary surgeon showed no symptoms proving the dog rabid. Née remained eleven days at Mr. Pasteur's Institute during which time he received twenty two inoculations. After each inoculation he complained of giddiness, felt sick and vomited. On his return to Arras on Novemver 29 nothing remarkable was observed except increase of appetite which had also been the case while staying at Paris. During the nights of December 10 and 11 intense pain was felt in the parts of the body pricked by inoculation, the pains rapidly invading the spine and continuing until the last moment. The patient was restless and said he was suffering from the inoculations in Paris and was sure he would die. A physician was called in who supposed that Née was suffering from lumbago and later on from inflammation of the spine. The above symptoms were followed with great difficulty of breathing, salivation, and convulsion of the muscles of the face. The patient had nightmare, was restless and sweated profusely but there were no general convulsions or hydrophobia. He could swallow easily except on the last two days of his life. On the 14th two physicians were called in consultation and they were in doubt whether the trouble was inflammation of the spine or the result of inoculations. Paralysis set in soon after, the right became more and more difficult and the saliva isued abundantly from both sides of the mouth. The patient died on December 17th. Now it it almost impossible to avoid the opinion that that patient died of hydrophabia,—that form which would probably result by inoculation from the spinal cord of a rabic rabbit, or as some style it, *rabbid derived* hydrophobia.

In justice to our American scientists, I must not omit Drs. Spitzka and Dulles of the United States. The Pasteur Institute at Odessa has been abondoned on account of the mortality among the patients.

Von Frisch's experiments and his conclusions have lately been confirmed in England by Mr. Dowdeswell, a practical physiologist who places his views before the public in the following words: "The method of protection against rabies as practised by M. Pasteur is unsuccessful with the rabbit, and the 'intensive method' of inoculation *is liable itself to produce the disease.*"

Dr. Constantin James was for a while a *Collaborateur* of Magendie the great vivi sector, and adhered to Pasteur as long as he practised his first methods but deemed it his duty to desert the Cabinet of M. Pasteur and doing so he pertinently asks: "Does it not communicate rabies?" which he answers affirmatively, and says: "Is it not the blindest empiricism?"

Had Goffi, whose case I have cited stood, Pasteur's method he would have been held up to the world as having been protected by this method *from*

hydrophobia. But it has been proved that he died *of* hydrophobia either from lack of protection or from the virus used to protect. The report of the English committee admits that the intensive method may have given rise to deaths as a result of inoculation. Now the intensive method has not protected nor did the mild form of inoculation protect, and so far we have no proof of protection from any form of treatment.

Your writer has been cited in the papers as having recommended Mr. Reed to go to Pasteur. This is not the fact. There was grave doubt in my mind that the horse ever died of rabies, and I so expressed myself, reserving the absolute pragnosis until after the inoculations on dog and rabbits. But Mr. Reed became so agitated and alarmed and would have it that the horse was rabic, that I feared what we call lyssophobia, a form similating hydrophobia and arising from fear. Dr. Peter Klein, who was in the health office when Mr. Reed came in, urged him not to be alarmed, as the danger from a grass-eating animal was very much less than from the dog, but he still argued that he knew the horse died of rabies. I then asked him if his desire was to go, and he replied: "Most assuredly; I will feel safer afterwards." The results of the inoculations on the rabbits show that the horse had not rabies, and Mr. Reed is safe, at least *as regards the bite of the horse.*

It is a fact which can now be considered as fully demonstrated, that if M. Pasteur cannot cure hydrophobia *his intensive method can give it.* This he abandoned in May, 1887, evidently frightened with the results. Now we have him in the attitude of abandoning the weak injections for the stronger and again fleeing in fear from the results reached by the stronger. The first plan did not protect and the patient died from hydrophobia derived from the bite. In the second (the intensive method) *all died,* some under such circumstances as to make it appear perhaps from the inoculations, and one boy inoculated in Russia, Arthur Stoboi Lublin, died *while the dog lived.* What do we want any plainer than that? The dog appeared afterward perfectly healthy. (*Riga Tageblatt, Dec. 21, 1886.*)

The intensive method has been condemned by Dr. Lutand, editor in chief of the Journal of Medicine, Paris; also by Professors Peter and Colin, of Paris; Dr. Clarke, of London; Professors Billroth and Von Frisch, of Vienna; Professor Michelacci, of Florence, Italy; Professors Rienzi and Amoroso, of Naples; Professor Ahren, of Lisbon. These all in Europe, and Drs. Spitzka and Dulles in America.

There is but one fact now staring us in the face, and as sanitarians I ask you to view it carefully and let it have its full weight. I would not detract one grain of renown from Pasteur. For what he has done he deserves our thanks; but having not lessened, as the results now prove, the deaths from hydrophobia it behooves him as a true philosopher to come forward and admit that his method has failed, and not endanger any more lives by inoculations, after the intensive method, and not to practice empiricism with the weak inoculations.

While Pasteur has failed in France, the stringent laws in Prussia for muzzling dogs have succeeded, as I have shown, by comparing the statistics of different countries, on page 38.

Prof. Von Frisch began as an ardent admirer of Pasteur, but left him when he adopted the intensive method. The animals which Pasteur claimed to have protected from rabies, he inoculated *before* they were bitten. The human subject he inoculated *after* being bitten. Prof. Von Frisch has supplied the

omission and finds that after having been infected with rabies, the inoculations before or after the infection fail to prevent or retard the course of this horrible disease. So falls the brilliant theory of the illustrious chemist; and while we regret it, as at one time we had hoped it might succeed, we turn our attention to the dog. We must begin with the origin of the evil. Carry out the system of legislation adopted by Prussia and muzzle the dog, and we stamp it out as she has done. Such investigations as these, while involving time, labor and money, do good and only prove the truth of Goethe's words:

"Das Wahre ist eine Fackel, aber eine ungeheure; deswegen suchen wir alle nur blinzend so daran vorbei zu kommen, in Furcht sogar uns zu verbrennen."

Truth is a torch, but a terrific one; therefore we all try to reach it with closed eyes lest we should be scorched.

A resolution was adopted thanking Dr. Duffield for his paper on the Pasteur method, which, at considerable inconvenience to himself, he had remained in the city to deliver.

Attention was called by the President of the convention to the worth of Heap's earth closet, several samples of which were on exhibition in the hall.

Mr. Stanley E. Parkill, of Owosso, presented the final paper before the convention. His subject was "The Water-Supply of Owosso." A map, and a number of descriptive charts added interest, and force to the gentleman's remarks.

THE WATER-SUPPLY OF OWOSSO.

BY STANLEY E. PARKILL, OF OWOSSO, MEMBER OF THE STATE BOARD OF PHARMACY.

To examine and report on the water-supply of a city the size of Owosso is no small undertaking, as I have found out to my sorrow since agreeing, some three months ago, to give a report thereon to this convention. There are many discouraging features to work of this kind aside from the trials and tribulations that always attend chemical manipulations.

There is a widespread opinion that the results of an analysis of well-water are of no special importance, and that if a water tastes good, is cold and clear, it is all right, the chemist's report to the contrary notwithstanding.

As a result of this belief I have found a large number of persons who are anxious to have their wells examined, simply to prove that they are good, and when the report is adverse, they lose all interest and confidence in it, asserting that the water from that well has been used for a long period of years and no one has been killed by it yet, so that they will risk it a time longer. They forget the fact that the continued use of an impure water, while it may not produce a disease that is traceable directly to it, leaves the system in a bad condition, and weakens its power to resist disease when it comes.

Said a gentleman to me the other day, "if you want a really good water to test your chemicals on, and see if they are correct, I can bring you a sample from my well that I know is good." I dare say that a report of 100 parts of chlorine in a million, and abundandance of nitrites would not shake that man's faith in his well. The great obstacle to advancement toward a pure water-supply, is the fact that each man's well, like his dog or his horse, is

the best one in town, and his cesspool or vault, even if it be but a hole in the ground, is free from any danger of pollution.

The question of a pure water-supply for our city has become one of the greatest importance: in fact it constitutes to-day the greatest problem that we as a city have to solve. Here we have a city of over five thousand inhabitants depending entirely upon wells, and for the most part shallow surface-wells, for its water-supply. These wells are sunk side by side with the privy vaults and the cesspools that receive the sewage of the household. I will venture the assertion that in that portion of the city lying between Oliver street on the north, Hickory street on the east, the river on the south, and Mulberry street on the west, and the entire length of Main street, from the river to the Michigan Central depot, there is scarcely a well so situated that a circle, having a radius of one hundred feet, with the well as its centre would not inclose from one to fifteen vaults and half that number of cesspools.

Now I wish to impress a few facts on your memory at the beginning.

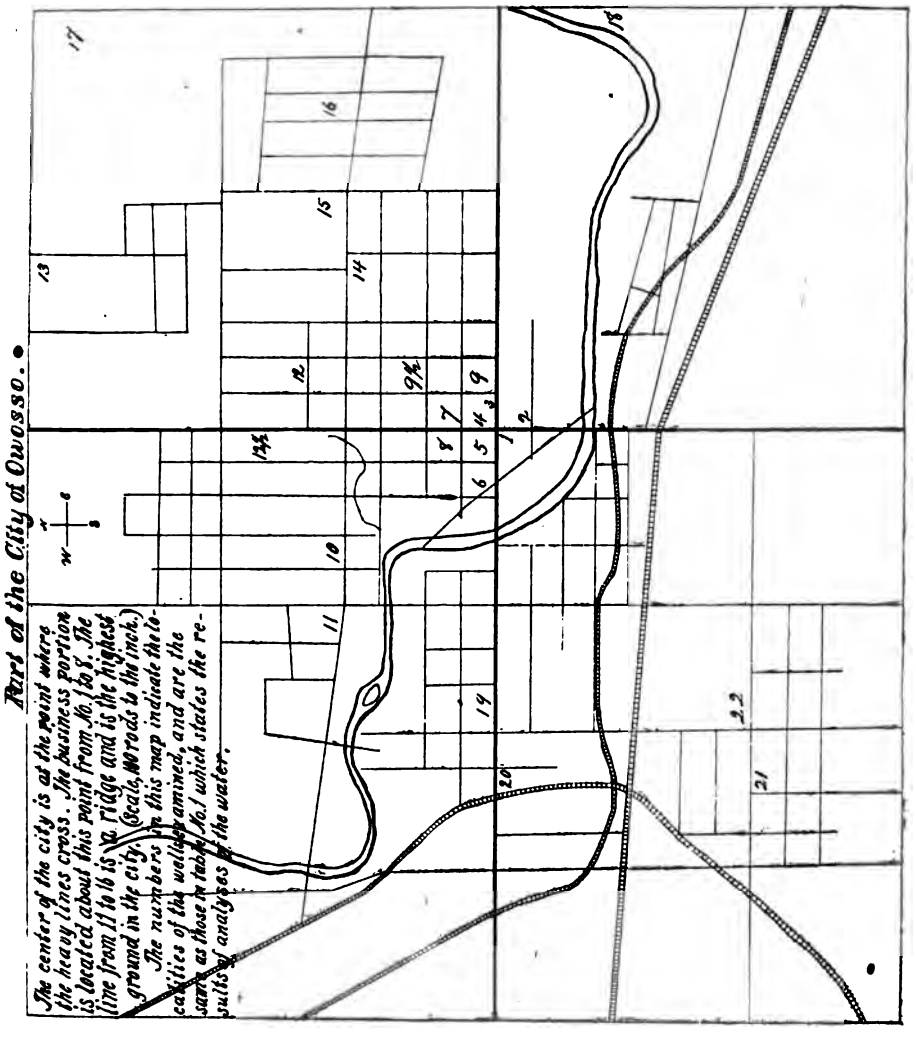
Continued pumping at a well lowers the water-level in the earth for a distance of from 100 to 1000 feet, varying with geological formation and the water-supply.

Percolation through the earth, particularly where the percolation is continuous *does not* purify the water. The germ of typhoid fever has been traced for miles, above and below the surface of the ground, to the source of pollution.

As before stated the principal source of our water-supply is from these surface wells. I know of but one family in the city using carefully collected and filtered rain-water for household use. Some others send to the mineral springs regularly for their supply. Some few have deep wells that are good, and quite a number believing their wells to be bad use water from a neighbor's well that is probably no better, but seems to be more favorably located.

Do not infer from this that I believe all the wells in the city to be bad. Far from it. I use the water from one of them myself, but I do believe that there is not a surface well in the populous portion of the city that could remain good if any considerable amount of water was taken from it, because the greater the amount of water taken from the well, the greater distance is the water drawn through the earth and the greater the chance for pollution.

That you may in part at least understand the analyses that are presented and the conclusions drawn therefrom, I will briefly, and in a very general way, explain the tests employed and their significance. This will enable you to follow the analyses presented, and also to form some opinion of your own as to the value of the samples reported. I have arranged the analyses according to location and not in the order of examination, for the sake of easier comparison of waters under similar surroundings.


Part of the City of Owosso.
The center of the city is at the point where the heavy lines cross. The business portion is located about this point from No. 1 to 8. The line from 11 to 16 is on a ridge and is the highest ground in the city. (Scale, 80 rods to the inch.)
The numbers on this map indicate the localities of the wells examined, and are the same as those in table No. 1 which states the results of analyses of the water.

To determine the value of a water for household use from a sanitary standpoint we estimate the amount of organic matter it contains.

First, Chlorine is evidence of contamination from vaults, showing the presence of saline wastes from the body.

Second, Albuminoid ammonia indicates the presence of organic matter.

Third, Nitrites indicate the presence of decomposing animal matter.

Fourth, Nitrates indicate previous contamination. A water containing an excess of nitrates should be watched carefully, if not condemned.

The chlorine was estimated with a standard solution of nitrate of silver. The ammonia by distillation with alkaline solution of permanganate of potash. The nitrites by the color produced by napthylamine hydrochloride and sulphanilic acid after acidulating with hydrochloric acid, and the

nitrates, by the zinc-copper couple, and estimating the nitrogen as ammonia with Nessler's reagent.

From a comparison of the examinations made it has been assumed that the following amounts of substances tested for may be considered safe, subject of course to change under varying conditions:

Chlorine, 20 parts per million.
Albuminoid ammonia, 10 parts per million.
Nitrates, 3 parts per million.
Nitrites, none.

In selecting samples I have endeavored to pick out representative wells that are in actual use, a report on which would be of some practical value. By referring to the map of the city, page 45, each well examined can be located by the numbers on the map corresponding to the numbers in the following list of wells, and the table given on page 50.

No. 1.—Well in constant use; chlorine rather high, still not as high as might be expected from the surroundings; albuminoid ammonia and nitrates are high and nitrites are present. The water is unfit for use.

No. 2.—Chlorides rather high, ammonia not in excess, but nitrates large and nitrites present. Water not fit for use.

No. 3.—Well in same locality, not used to any extent. It gives a good analysis, but should be watched, for like "Dog Tray," it is in bad company.

No. 4.—Analysis not complete. An opinion would be based on the amount of nitrates present.

No. 5.—Chlorine high, nitrates rather high, nitrites present. Water bad. [See cut No. 2.]

No. 6.—Chlorine very high, nitrates high. Water bad. [See cut No. 2.]

No. 7.—Chlorine very high, nitrates rather high. Water bad.

No. 8.—Two analyses a month apart. Chlorine very high, ammonia high, nitrates high. Water bad. [See cut No. 3.]

No. 9.—Chlorine a little high. This result under more favorable circumstances would be good.

No. 9½.—Good.

No. 10.—Water good except for the presence of nitrites. Suspicious.

No. 11.—Well 162 feet deep. Good.

No. 12.—Large excess of nitrates, otherwise good. Suspicious.

No. 12½.—Well 150 feet deep. So far as examined, good.

No. 13.—This well was among the first examined. Attention was called to it because of the number of cases of typhoid fever in the family. It is in the outskirts of the city in a thinly settled region. The vault is fifty feet away and full. Analysis shows chlorine rather high, ammonia high, nitrates and nitrites both present—probably in greater quantities at the time of the fever than the analysis shows, as the examination was made a month later. We trace six cases of typhoid fever to this well, five in the family, and one, a woman who did washing there. Bad.

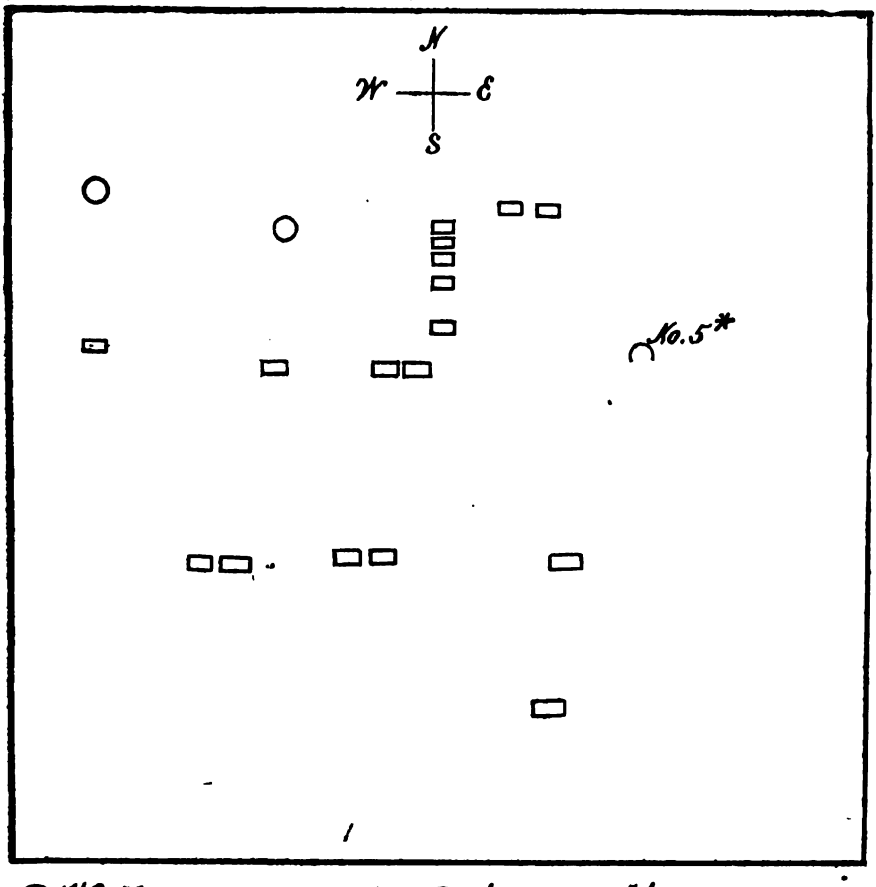
No. 14.—Chlorides and ammonia high, nitrates present in quantities that are suspicious in connection with the other impurities. Water bad.

No. 15.—Water slightly turbid, nitrates not estimated. Water probably good.

No. 16.—A dug well, and impurities probably come from the surface. Contains a slight trace of nitrates. Water good.

Cut No. 2.

Exhibiting the location of wells and privy-vaults on the block in which is well specified as "No. 5" in Table No. 1, and in the map of a part of the City of Owosso.



○ *Wells.* □ *Privy-vaults.*

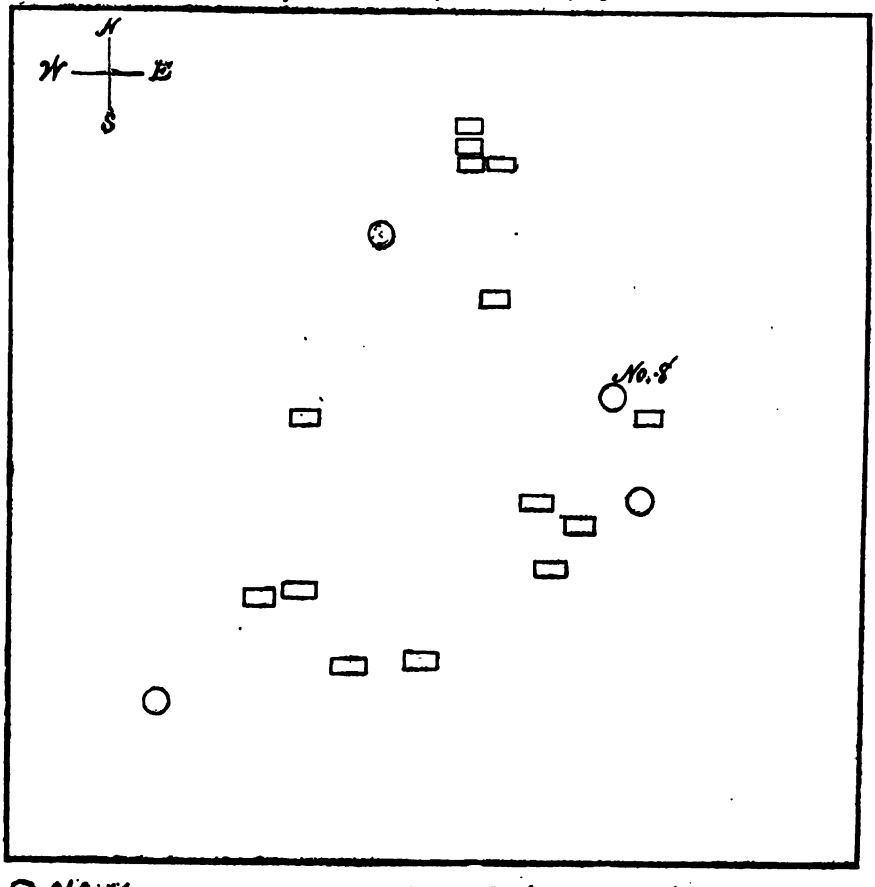
* *Nearly one-half of the merchants of Owosso use the water from this well.*

No. 18.—River water taken from a point above the city and above the creeks that flow from the marshes on the south. The analysis indicates that the excess of albuminoid ammonia is in all probability of vegetable origin. The small amount of chlorine shows absence of sewage. The water for a river-water is fair, and fully as good as the water-supply of many cities.

No. 19.—Chlorine rather high; nitrates high; nitrites present in small quantities. At the best, the water is suspicious.

Cut No. 3.

Exhibiting the location of wells and privy-vaults on the block in which is well specified as "No. 8" in Table No. 1, and in the map of a part of the City of Owosso.



No. 20.—The only suspicious feature is the amount of chlorine, but in the absence of excess of albuminoid ammonia, simply a trace of nitrates, and no nitrites, the water is considered good.

No. 21.—This sample comes from that portion of the fourth ward south of the junction. Fifteen years ago it was a swamp covered with water for at least half the year. It is a dug well probably not over fifteen feet deep. Chlorine high, ammonia very high, nitrates not estimated. Water bad.

No. 22.—Fourth ward school. Well one hundred feet deep. Water good.

Nos. 17 and 23.—Samples from Gould's and Hopkin's lakes, situated about a mile and a half northeast and southwest of the city, respectively. Of course no person expects to use these waters for household purposes. A

glance at their surroundings would convince the most skeptical that they were unfit. But we are now brought face to face with the problem of a pure ice-supply for the coming season. The river, since the removal of the stones of the old dam, is too low to allow of the formation of ice of sufficient thickness, and these lakes have been turned to as a possible source of supply. The Gould lake-water is the worst I have found, and the Hopkins lake is but little better. Both are totally unfit for an ice-supply and no ice gathered there should be allowed to be distributed through the city, where it is liable to be used in drinking-water.

It is a very common belief that water from an impure source is purified by freezing. To a certain extent this is true, but the purification is not complete enough to permit of the use of ice gathered from so foul a source.

So much for our present water-supply. But what for the future? Certainly the report on our present supply is not encouraging. If you think it is good, notwithstanding the analysis, just recall the cases of and deaths from typhoid fever alone in a year.

We cannot depend on surface wells for water for a city supply, unless they are situated beyond the city limits in a favorable locality. Who can tell in our growing city how far that must be? The question of expense must also be considered.

So far as I have tested the water from deep wells I have found it uniformly good. (See Nos. 11, 12½ and 22, the depth varying from 100 to 160 feet.) It seems to me that the easiest solution of the problem lies in the sinking of deep wells as far from the center of the city as possible, in a locality where the drift would be from the well to the city, and not from the city to the well. The river water is undoubtedly better than most of the wells in the city, but, if it is used, a careful series of analysis running through many weeks would be necessary before the report given could be sustained or condemned.

TABLE 1.—*Exhibiting the Analysis of 26 Samples of Water taken from Wells in the City of Owosso, the Shiawassee River, and Lakes near by.*

(The upper line of figures opposite each well represents the number of parts found of the substance tested for, in a million parts of water. The lower line shows the number of grains in a gallon of water.)

Date.	No.	Chlorine.	Free Ammonia.	Alb. Ammonia.	Nitrogen of Nitrates and Nitrites.	Nitrogen of Nitrites.	Nitrogen of Nitrates.	Depth of Well, ft.	Quality of Water.
11- 6	1	46. 2.683	.032 .00186	.152 .00886	6.18 .364	.24 .014	5.94 .350	24	Bad.
10-29	2	43. 2.4276	.028 .00163	.074 .00431	10.54 .614	.2 .01166	10.34 .608	18	Bad.
10-28	3	25. 1.408	Trace.	.084 .0049	3.951 .23	None.		20	Good.
10-31	4	63. 3.674	.01 .00058	.03 .00175		None.		20	
11- 4	5	80. 4.665	.016 .00093	.06 .0035	6.59 .434	.04 .00231	6.55 .432	About 20	Bad.
11- 7	6	325. 18.953	Trace.	.052 .00606	7.5765 .442	None.		About 20	Bad.
10-27	7	323. 18.836	Trace.	.032 .00186	5. .291	None.		24	Clear, bad.
		323. 18.836	Trace.	.11 .0064	5. .291	None.			Turbid, bad.
10-25	8	216. 12.60	.0714 .00416	.192 .0112	18.176 .768	Trace.		20	Bad.
11-18		208. 12.13	.004 .00023	.072 .0042	10.7 .624	None.			
10-26	9	40. 2.332	Trace.	.04 .0023	4.117 .24	None.		22	Fair.
10-26	9½	17. .991	.1254 .0073	.06 .0084	.05 .008	None.		30	Good.
11-8	10	20. 1.166	.064 .0042	.068 .004	3.3 .192	.1 .0058	3.2 .1862	40	Suspicious.
11-12	11	27. 1.5745	.026 .0021	.054 .00326	1.235 .072	None.		162	Good.
10-19	12	34. 1.97	Trace.	.0122 .000769	19. 1.108	None.		20	Suspicious.
9-19	12½	2. .116	.184 .0107	.02 .00116				150	Turbid, good.
9-20	13	37. 2.177	.17 .009	.127 .008	2.47 .144	.08 .00466	2.39 .1393		Bad.
11- 1	14	117. 6.823	.08 .0046	.324 .0189	5. .291	None.		11	Bad.
11-15	15	3. .175	None.	.044 .0025		None.		About 25	Good.
11-15	16	11. .621	None.	.016 .0009	4.12 .241	Trace.		20	Good.
11-16	17	3. .174	.768 .0448	1.62 .0944	None.	None.			Turbid, bad.
11-17		3. .174	.688 .089	.92 .0536	None.	None.			Clear, bad.
11-17	18	7. .408	.02 .00116	.188 .0109	None.	None.			Fair.
11-18	19	42. 2.45	.02 .00116	.064 .00373	13.53 .789	.01 .00058	13.52 .7884		Bad.
10-27	20	55. 3.207	.072 .0042	.042 .0024	.062 .3047	None.		18	Fair.
11-14	21	77. 4.49	.584 .034	.6 .035		None.		About 15	Bad.
11-12	22	45. 2.624	.104 .006	.016 .00093	.412 .024	None.		Over 100	Good.
11-18	23	3. .175	.33 .0192	.82 .0478	Trace.	.02 .00116			Bad.

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DISCUSSION.

Dr. H. B. Baker: This paper is of sufficient practical value to pay for all the expenses of the convention.

Dr. S. P. Duffield: As a chemist I wish to endorse the paper read. In 1858 and 1859 no such careful analyses by pharmacists were known. This work is the outgrowth of our State University, and the citizens are now, through the labors of those trained there, receiving back their investments in that institution. Mr. Parkill deserves the highest praise, and his work should be looked on by you all with pride.

On the motion of Rev. Mr. Donnelly the hearty thanks of the convention were given Mr. Parkill.

In answer to a question, Dr. Duffield stated that the objection to the river as a water-supply was that the contaminating materials which it receives are not known. Unless the citizens are absolutely sure that the river water is pure, they should hesitate about using it. The cistern system is one of the best. Since New Orleans has adopted it typhoid fever has diminished.

Professor Bates of the Owosso High School, gave the result of recent analyses of the mineral spring:—

ANALYSIS OF OWOSSO MINERAL SPRINGS.

[This analysis was made in the summer of 1887.]

BY PROFESSOR R. C. KEDZIE, STATE AGRICULTURAL COLLEGE.

Grains Per Imperial Gallon (10 lbs. av.)	*Grains.*
Volatile at red heat	4.6
Mineral residue	18.4
Total grains of solids	23.0
The Mineral Residue Contains	
Carbonate of lime	14.0
Sulphate of lime	.4
Carbonate of magnesia	3.0
Chlorides	.1
Oxides of iron and silicon	.9
Total mineral residue	18.4
	Parts Per Million.
Free Ammonia	.08
Albuminoid Ammonia	.08

ANALYSIS OF OWOSSO MINERAL SPRINGS.

[This analysis was made in the summer of 1887.]

BY C. O. BATES, OF OWOSSO.

Grammes Per 1¼ Liters.	*Grammes.*
$Si\ O^2$	.0200
$Al^2\ O^3$	.0080
$Fe^2\ O^3$	.0040
Ca O	.2110
Mg. O	.05811
Cl. (as chlorides of Na and K)	.00067

ANALYSIS OF OWOSSO MINERAL SPRINGS.

[This analysis was made about the year 1870.]

BY PROFESSOR S. P. DUFFIELD, OF DETROIT.

	Grains Per Gallon.
Bi-carbonate of Lime	26.667
" " " Mg	19.094
" " " Fe	15.920
Chlorides of Na and K	2.102
Silicon and Alumina	.617
	63.400

Dr. S. P. Duffield, replying to questions: The character of the spring is liable to change, especially as regards the quantity of carbonic acid gas. There are iron deposits near the spring, and enough is carried off in the water to make it a tonic.

All filters for water have thus far proved deceitful. The filter becomes saturated and then it becomes difficult to purify the filter.

The geological formation of our State is like a basin, and is not calculated to hold gas as Ohio and Pennsylvania do. A gas well is not likely to last in this region.

At the close of Dr. Duffield's address, the Rev. John Donnelly presented the following resolutions which were unanimously adopted, the audience signifying their approbation by rising to their feet.

WHEREAS, The Convention under the auspices of the "State Board of Health," has been in session in our city the last two days, and the meetings have been open to the general public, to the great profit and enjoyment of all who have attended them, Therefore

Resolved, That the thanks of the citizens of Owosso be extended to the "State Board of Health," for its action in selecting this city as the place for a sanitary convention.

Resolved, That our thanks are hereby tendered to the members of this Board, and all others who have contributed papers and discussion for the general good of the convention.

Resolved, That we have listened to the deliberations of this convention with very great pleasure and profit and believe they have placed the city under great obligations, for the valuable discussion of questions of vital importance to the health and comfort of the community.

Resolved, That we express our high appreciation of the Board in spreading before the people of our State information so essential to the good and health of the people, and believe any city may deem itself fortunate in securing sessions of this character.

Dr. H. B. Baker: On behalf of the visitors I wish to extend our thanks to the officers of the convention, the local committee, and others who have so earnestly labored to make the convention a success.

Rev. Mr. Wilson: Every one who has attended the sessions of this convention has been profited. The benefit to the city of Owosso is beyond estimate.

The convention then adjourned.

STATISTICAL ASSOCIATION.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTIO

HELD AT

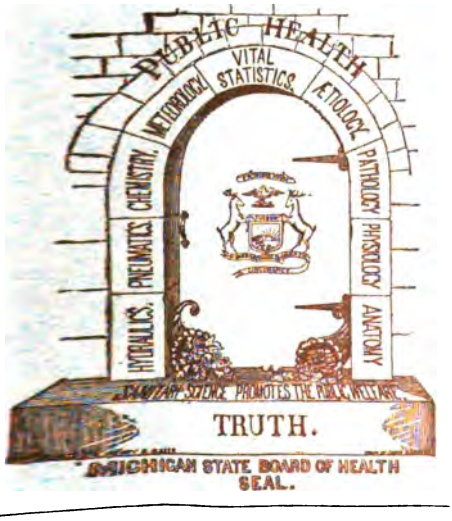
ALBION, MICHIGAN,

DEC. 6 AND 7, 1887.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARI HEALTH AND A COMMITTEE OF CITIZENS OF ALBION.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR TH YEAR 1888.]

[Reprint No. 274.]



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PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

ALBION, DEC. 6 AND 7, 1887.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1888.

Thorp & Godfrey, State Printers and Binders, Lansing.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT ALBION, MICH., DECEMBER 6 AND 7, 1887.

SUPPLEMENT TO REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1888.

This Convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Albion, acting with a committee of the State Board of Health.

The following named persons constituted the local committee: Prof. Delos Fall, Chairman; Dr. A. G. Bruce, Dr. W. W. Collins, Hon. L. J. Wolcott, Hon. F. F. Hoaglin, Hon. R. L. Warren, Dr. W. O'Donohue; Dr. H. D. Thomason, Secretary.

The committee from the State Board of Health consisted of Henry B. Baker, M. D., of Lansing.

The committee on music was Prof. Carl B. Scheffler, and Prof. S. F. Ganung, of Albion College.

The officers of the Convention were: *President*, L. R. Fiske, D. D., LL. D.; *Vice-presidents*, Hon. Robert L. Warren, Albion; Hon. J. W. Sheldon, Albion; Prof. S. D. Barr, Albion; E. F. Mills, Albion; Hon. J. C. Patterson, Marshall; Dr. W. A. Lane, Homer; Peter Mulvaney, Marengo; Prof. F. M. Harlow, Springport; Hon. F. F. Hoaglin, Albion; S. V. Irwin, Albion; Hon. L. J. Wolcott, Albion; O. C. Gale, Albion; Dr. A. W. Alvord, Battle Creek; Prof. D. H. Haskins, Concord; Prof. C. E. Townsend, Jackson; Thomas J. Stimpson, Parma; Secretary, Dr. H. D. Thomason, Albion.

There was a large attendance of citizens at all the meetings, the Opera House being crowded at the evening sessions.

First Session—December 6, at 3 P. M.

The Convention was called to order at the Opera House by Dr. L. R. Fiske, President of the Convention. After a prayer by Rev. W. E. Parsons, of Albion, Hon. J. L. Wolcott, mayor of the city, delivered the following address of welcome:

ADDRESS OF WELCOME.

BY HON. J. L. WOLCOTT, MAYOR OF THE CITY.

Mr. President, Members of the State Board of Health, Ladies and Gentlemen:

This is an occasion in the history of Albion that will long be remembered. In times past we have entertained and been honored with the presence of other assemblages, religious, political, scientific, and agricultural. But this is the first time that philanthropists have come to us to discuss those great practical questions, relative to the guardianship of public health.

Members of the State Board of Health, your coming may mark an important epoch in the history of this place, and, because of the relations which I sustain to the municipality, I am glad to welcome you in behalf of the citizens of Albion and to extend to you the freedom of the city. A hundred homes or more are ready to receive you and bid you welcome, as evidence of their appreciation of your coming.

Citizens, strangers are with us; they come not with saddle bags and medicine cases filled with panaceas for aches and pains, nor do they profess to heal the sick, cause the lame to walk or the blind to see; but they come with a stock of golden rules and treatises on sanitary science, the result of years of study and of practical experience.

So far as our city is concerned, we feel confident that in point of location we are more than usually blessed. At the same time we recognize the value of detailed instructions in the proper care of our city and our homes. We realize that sanitary science is in its infancy, and all attempts to further it and bring intelligent attention to its teachings should be welcomed by thinking people everywhere.

But, gentlemen, in our devotion to our city (to many of us the home of our childhood), and our anxiety for its future welfare, we might overlook the germs of some epidemic that might now be hiding in our midst; so feel yourselves at liberty to criticise, harshly if occasion requires, any neglect or oversight on the part of citizens or council, for the general good of the public health. The question of water-works has been agitated to quite an extent, and the question is now in the hands of a special committee which expects to profit by your coming. If the time has come when the public health requires a public improvement, even to the extent of thousands of dollars, the people will not be slow to act, when convinced that the public good requires it.

Pardon me for the liberty I take and the time I occupy, but I must tell you something of our city (not yet three years incorporated as such), with less than four thousand people. In wealth it will compare favorably with any city in the State of the same size. Our manufacturing industries are not what we wish they were. However, they are such as many a city greater in wealth and population would be proud of. Nearly four hundred men are employed in the several factories, shops and mills.

Nearly every State in the Union, as well as foreign countries and the islands of the sea, are sounding the praise of the Gale plow, and the same may be said of the Albion rakes and harrows, and Albion flour. The Wolcott windmills can be found in twenty-four States and Canada. We also have a tannery, planing mill, sash and blind factory, and lastly a medicine factory that has been doing a thriving business up to the coming of this

convention. I cannot say what effect the convention may have on this institution.

I would be glad to speak of our schools and college, our churches and societies, but as our worthy chairman, Dr. Fiske, will address you later, he will undoubtedly tell you all about it.

There is much of importance that I would be glad to speak of, if time would permit, but I wish to impress upon your minds that we have a beautiful little city, not destined to be a Chicago or Detroit, but destined to move onward in wealth and population until we can enjoy all the advantages of water-works, sewerage, and other public improvements that belong to a city three times our size. Again I welcome you, and thank you for your prompt response to our citizens' call for a convention. May it be pleasant for you, an advantage to the city, and profitable to all who atttend.

Henry B. Baker, M. D., Secretary of the State Board of Health, then responded to the address of welcome, stating the objects of the Convention. After which, the Secretary of the Convention read the following letters of regret:—

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, Dec. 3, 1887.

DR. HENRY B. BAKER, *Secretary, State Board of Health, Lansing, Mich.:*

DEAR SIR: Referring to your communication and programme for a Sanitary Convention to be held at Albion, Mich., under the auspices of the State Board of Health, I regret to say that I shall not be able to be present.

It is very gratifying, however, to observe the interest taken in Michigan in such matters; and I am sure that the outcome of such meetings and discussions must be beneficial to the country at large, and to Michigan in particular.

The Chief Signal Officer has followed with interest the work of the State Board of Health with which you have been so creditably connected for so long a time, and has been much gratified to note the fact that you appreciate the intimate interconnection between climatic conditions and health conditions.

Very sincerely yours,

A. W. GREELY,
Chief Signal Officer.

STATE BOARD OF HEALTH, EXECUTIVE OFFICE, 1532 PINE ST.,
Philadelphia, December 3, 1887.

DR. H. B. BAKER:—

DEAR SIR: Please accept my thanks for the invitation to the Sanitary Convention to be held at Albion, Mich. I regret that I shall not be able to attend the Convention.

Yours respectfully,

BENJAMIN LEE, M. D.,
Sec'y State Board of Health.

Then followed the President's address:

SANITATION FROM THE STANDPOINT OF THE INDIVIDUAL.—SANITATION FROM THE STANDPOINT OF THE STATE.

BY REV. L. R. FISKE, D. D., LL.D., PRESIDENT OF THE CONVENTION.

I accept the position of President of this Convention for which I have been named with a profound sense of my inability to guide you in your deliberations for the development of wider scholarship and more successful methods in the great work to which your thoughts are given. That the

average period of human life ought to be greater than it now is, and that it would be if hygienic conditions were better understood and more commonly observed, is a proposition to which all will assent. I would not dare to give expression to any of my poor thoughts on this occasion did not your circular tell us that "this is not merely a doctor's convention, but it is for the people generally." You should have put a physician in this chair whose broad scholarship and fertile professional brain would inspire you to enthusiasm in seeking out more healthful channels for the current of human physical life. I do not say these things to apologize for my shortcomings, but to chide you into better ways in the future.

But I am aware that, while the medical is the profession most devoted to the work of lessening disease, it is employed almost exclusively in the art of healing, and that the prevention of disease receives comparatively little attention. It is not purely, perhaps not largely, a sanitarial profession. Were its pecuniary income increased by the increasing prevalence of health rather than by the prevalence of disease—were its work to keep the people healthy, for which compensation should be rendered, rather than to cure the sick, the prevalence of health would professionally be quite unlike what it is to-day. I make this statement in part to remove the diffidence, in the expression of views on sanitary subjects, of such members of this Convention as are not physicians. Were you all doctors, I should, in self defense, lay down the gavel and beat a hasty retreat; not that I would fear personal harm, but because for me to preside over a convention of medical specialists would be absurd in the extreme.

While in the nature of the case we cannot, all of us, become specially learned in sanitary matters, there is a somewhat wide range of intelligence on questions of health which we ought to possess. This can be gained non-professionally, and it is a valuable feature of our advancing civilization that these problems are engaging more attention than at any time in the past.

I shall invite your attention to some thoughts on "Private and Public Hygiene; or Sanitation as related to the Individual and Sanitation as related to the State."

The subject of private hygiene is restricted to the individual and family. Did each individual take the best sanitary care of himself, and if the family life was carried forward under the most healthful conditions, the State, though still endowed with sanitary functions and charged with sanitary responsibilities, would have comparatively little to do in guarding the health of the public. But what is involved in individual hygiene? In what particular ways are the laws of health violated? These questions, had we time, would admit of a very wide range of discussion. It would be necessary for us to take up the subject of food,—its kind, preparation, amount, the time of partaking of the same, frequency of use, mastication, etc. The relation of beverages to the best hygienic effects must be considered. Into the problem necessarily would come the influence of alcoholic stimulants, of decoctions, of tea, coffee, chocolate and other similar beverages, and of hot and cold water. The consideration of the effects of tobacco, as chewed and smoked, must have a place in the discussion. The clothing worn in summer and in winter, the relation of the same to warmth, and the unobstructed functions of the skin, would demand attention. Many questions would arise in regard to the sanitary relations of ablution, the frequency of ablution, the temperature of the water and condition of the body.

The number of hours to be devoted to sleep, at what time sleep should be taken, and what are the most favorable conditions for restful sleep,—these topics could not be passed by. The employments of both body and mind must have a place in our discussions. May not the muscles be used too little, and may they not be used too much? What is the effect on the body, of study or thought—the vigorous use of the intellectual powers, and in a broader sense of the condition of the mind? How much ground is there for the healthful operation of what is called the metaphysical principle or "Christian science method," that is, the purely subjective mental process, to maintain the functions of the body in their normal and healthful condition? In a word, what should I do to preserve health, to make my physical life most vigorous, to protect myself most fully from disease, and to give the greatest length to the period of earthly life?

Different portions of this whole subject of individual hygiene have been studied with great painstaking by specialists, so that much valuable knowledge has been gained; but a great deal yet remains to be determined. It is probable that no exact rule could be laid down for universal application, as there are so many types of physical life. But evidently it is possible to reach results of such general rational application that health may be the almost unvarying rule, and disease reduced to a small fraction of its present amount, provided the people avail themselves of the light that is within their reach. For the development of required knowledge boards of health are at present doing a great work, both in direct researches and the inspiration communicated to others for humanitarian investigations. But the public, in the general habits of the people, by no means live up to the principles already determined. With perfect knowledge on the part of the public, there would still be much shortcoming, but, at present, disease is due very largely to ignorance of the laws of health and of the best means of observing these laws.

Hygiene is now taught to a considerable extent in the public schools, not as a specialty, but incidentally in connection with physiology. Would not much be gained by giving it a place as a distinct branch in our public school system? Something is done in this direction under the requirement to give instruction on the evil effects of alcoholic stimulants, but the range of instruction should be much wider than this. Albion College for several years has included sanitary science in her regular curriculum of work, and considerable interest has been manifested in this subject. I regret that but few colleges have introduced this branch of study. The delay is due to an unfortunate spirit of conservatism in the majority of institutions, a clinging to old methods and the traditions of ages which our civilization has greatly outgrown. Every newspaper, secular and religious as well as scientific and professional, ought to maintain a column on practical sanitary science. To violate the laws of health, except in cases of extreme emergency, —under the exigency of some great moral demand, is a crime, and such we need to regard it. Even to secure intellectual achievements we have no right to weaken the physical energies of our being.

The subject of home sanitation is very closely allied to individual hygiene. I make it a distinct division of the general topic, because I desire to emphasize the responsibilities of parents to look after the health of their children. There is much censurable neglect in this matter. To make money, to get along economically, perhaps to have a pretentious home or to give the years

to social pleasure, causes a neglect of proper provisions for the health of the family.

Is the dwelling in which our days and nights are spent wholesome? If in a decaying condition, or damp or mouldy, or containing poisonous material, such as arsenic paper, it must be unhealthful. Or the residence may be located in a region subject to general or local malarial influences. It is a very common thing for the cellar to be damp from natural causes or from a careless admission of surface water. A building cannot safely be occupied for an indefinite period of time without reconstruction if it is composed of perishable material, as all houses are quite sure to be to a considerable extent. To provide a wholesome dwelling, the water-supply, also, must receive intelligent attention. Still further, we must not neglect precautions to remove all waste or refuse matter. There are many important questions which arise in regard to the location and care of outhouses. There are two additional questions that cannot be left out of the account; these relate to the ventilation and heating of our dwellings. Each is too comprehensive for discussion here. Putting the two together, in cold weather one is very likely to be secured at the expense of the other. There are several inquiries that arise. Can a building be economically warmed in connection with adequate ventilation? If so, how can it be done? Are there any serious objections to the heating of dwellings with hot-air furnaces? Which is to be preferred, heating with hot air or by steam? Should a building ever be heated with steam wholly by direct radiation? Should sleeping apartments be warmed in severe winter weather? Is it healthful to keep an open window through the night in an occupied sleeping room where the outdoor temperature is at or below zero?

On the public side of sanitary science there are many important questions, including drainage, sewerage, disposition of garbage (especially in relation to streets and alleys of cities), water-supply, ventilation of churches, halls and school buildings, species of manufacture that corrupt the air, condition of outhouses, health of animals slaughtered for food, vaccination, quarantine at our seaports, provision for arrest of contagious diseases, etc.

It is evident that there are sanitary interests which cannot be left to the judgment or generosity of individuals. That the best results may be reached the public must act through some agency designated for such purpose. I am aware that there is a chance to raise the question as to the danger of violating private rights. An eminent physician in New York recently said to me that, in his judgment, the State was guilty of too much interference in private affairs in these matters. The subject is evidently beset with many difficulties, and there is room for a wide difference of opinion on many of the questions that must arise. It is often said that that people is governed best that is governed least. Everything that is proper to be done we are told should be left to the individual. It is the sole function of the State to protect,—to protect the citizen from infringement of rights, protect his person from violence, protect his property from destruction, protect him in the free use of his powers so far as he is not guilty of actual infringement of the natural prerogatives and legitimate interests of others. The State should not substitute its activities for his, but should secure to him the largest measure of personal activities within the sphere an individual may rightfully occupy. These and these only, we are told, are the functions of the State. In this we find the assumption that the individual can do every-

thing it is best to have done, except the protection of private rights and interests, also that the work he can do will be accomplished by him more efficiently than if performed by the State. But when the State keeps itself within these prescribed limits is the welfare of the citzen most fully conserved? Cannot the State do many things better than the individual? Could you turn over our postal interests to private parties? What would be the result if the government should withdraw and leave it to individuals to negotiate for mail service? Would not a large part of our territory be without mail facilities? Could you leave this matter to private competition? Cannot the government, in the unity of its organic life, provide for all parts of our broad domain with tenfold greater ease than any individual enterprise? A certain measure of education is necessary to meet our responsibilities as citizens in a government by the people. Would anybody in this part of the world think of setting aside the public school, sustained by general taxation, and substituting therefor a system of private schools? Is it the carrying out of a vicious policy when the State erects lighthouses at points where navigation is dangerous? Is she doing too much when she constructs harbors for our shipping, dredges the bars that form in navigable rivers, and opens up definite channels of communication and traffic between different States? Is government a usurper when it establishes rates of interest, and determines and regulates the currency of the people? Does it transcend its rightful authority when it builds schools or asylums for the blind and deaf and dumb? But without pursuing this subject any further, does the government exhaust all its legitimate functions when it simply protects the citizen in the enjoyment of his natural and social rights? Does not the welfare of the public—every part of the public—require that the State, by positive acts, contribute to the forces and agencies which are fitted to swell the sum of happiness and prosperity of the people? Should not the State give as well as protect—do, as well as protect us in doing? So it seems to me.

In nothing perhaps has the State failed more frequently than in providing for the sanitary wants of the people. She must meet her obligations in two ways, by devising and executing proper sanitary measures, and by enforcing regulations to prevent the individual citizen from doing anything prejudicial to the health of the public. Everybody concedes the right of the government to establish quarantine—isolating a ship so as to prevent intercourse with the people when there is suspicion of existence of an infectious disease. Thus travel is arrested and business interests give way to the broader rights of protection of life and health. It is a very common thing to forbid the importation of cattle or of dressed meat from a country where the cattle are believed to be infected with disease. Sanitary measures, however, are generally of a more local character.

Michigan is greatly indebted to State legislation for drainage. Within our territory there is a large amount of swamp land, which unless reclaimed by drainage would not only be useless for agricultural purposes but would also be harmful to the health of the public. This work will not be done except by the State. A municipality adopts a system of sewerage, employs men to perform the work and imposes a tax to meet the expense. That the desired end may be reached there must be a system having unity; this involves unity of jurisdiction and execution, with power. Public health requires that all decaying and noxious substances be removed so as not to infect the air.

Small-pox appears in the community and immediately the Board of Health issues an order for vaccination. The authorities remove small-pox patients to some isolated building, called a pest-house, whether such persons are willing to go or not. Houses where diphtheria, or scarlet fever or other contagious diseases exist are quarantined. Conditions may exist in which the municipality may feel authorized to demolish buildings in the interest of health. Thus it seems to me the State possesses no functions more unquestionably legitimate than its right of guardianship in sanitary matters.

My residence in Albion the past ten years has convinced me that the sanitary conditions of the place are equal, and perhaps superior to the average of the villages and cities of the State. Certain it is we have been spared the visitation of epidemics and the presence of disease alarmingly fatal. It is fortunate for us that the Kalamazoo river with its rapid current serves as an outlet for water that might otherwise become stagnant; and this stream, perhaps, at the same time removes organic matter which by accumulation would contaminate both the air and soil. It is evident that if the water is not impeded in its channel, if it does not overflow its banks and become stagnant, it must perform a purifying office. It carries away the washings of the soil, and is a natural channel of drainage.

But it seems to me that the people of this city might well take advantage of the holding of this Convention to study the question of possible sources of disease, and to see what could be done to add to the healthfulness of the place. Let me therefore ask,—Are the health conditions of Albion, growing out of its topographical relations, of the most perfect character? If so, it will be a great source of satisfaction to know the same; if not, what should be done to correct these defects? No change should be made in obedience to an unreasonable whim, but a candid, dispassionate study of the question of health in relation to our topography must result in good.

There is not a large amount of low or marshy ground within the limits of the city or contiguous thereto. The swampy land lying at the west is easily drained, and, I think, does not supply specially unfavorable conditions. Below the dam in the river, the water, a considerable portion of the year, is lower than it otherwise would be, and therefore I suppose less land is under water. Above the dam, however, the water sets back from the stream on either side, practically forming a pond. In this there is a large growth of vegetation, and it is probable that in time it will become a swamp. The effect of this body of stagnant water, together with growing and decaying vegetation dependent on the same, upon the health of the city may well, I think, be carefully studied. I shall not indulge in any speculation on the present occasion. I am disposed, however, to call your attention to the use of ice by our citizens, as its supply must come principally from this source. The ice must partake of the character of the water from which it is formed. If the water of the pond is pure the ice will be pure, but if impure, the ice will be impure. There are two facts to be considered, especially in the absence of chemical analyses (and such analyses to be of the most value should be made at different seasons of the year, as the conditions must greatly vary). These two facts are: (1) The relation of the water to sources of impurity in the bed of the river or pond, and (2) its topographical relation to the cemetery. I have no sufficient data for a scientific discussion of either of these questions. No judgment could be formed as to the extent of impurity—if any—arising from these sources, except as the

result of very careful investigation, which might require months of time, perhaps years. This is true,—the cemetery adjoins the river, and it is upon ground that is considerably higher than the river. The products of decomposition of bodies buried therein may sink into the earth entirely away from the reach of the water of the river. If the earth underneath the graves is sand to a depth lower than the bed of the river, it is probable no contamination takes place. If, however, an impervious substratum, as of clay, exists before such a depth is reached, and this impervious layer inclines toward the bed of the stream, serious contamination would by no means be improbable. It is desirable to have this whole subject thoroughly investigated. But whether any impurities be washed into the river from this reservoir of decay or not, should we introduce the ice we get from any source of supply, into our drinking water? It is rarely pure. I may say it generally contains a much larger measure of impurity than the water of our wells or springs, and may not all the advantages of cooling with ice in the summer be secured without drinking water containing melted ice? Bottles filled with water and placed in an ice box will be sufficiently reduced in temperature for use in the warmest weather. Aside from the introduction of impurities into drinking water, by putting ice therein, it is unquestionable that harm is done in many cases by drinking the ordinary ice-water because of its low temperature.

In conclusion I may say that the subject of water-supply for any city is an exceedingly important one. I understand a paper will be presented at this Convention on the relative impurities of water taken from different wells in Albion. This may cause the question to be raised as to whether our citizens should be content with our present mode of supplying this necessary beverage.

I thank you for the honor you have shown me in calling me to this chair. I wish my studies in life had been in such channels as to enable me to lay before you something new on this occasion. Being unable to give you the result of any original investigations, I have attempted only to direct your view to the two important subjects of private hygiene and public hygiene, and now exhort you to do what I have not done, that is, to push your researches into new fields of inquiry, that the world may be profited by your labors.

Second Session—December 6, at 7:30 P. M.

THE PRESENT AND FUTURE WATER-SUPPLY OF ALBION.

BY PROF. DELOS FALL.

LADIES AND GENTLEMEN:—The man who complacently boasted that water had not touched his back for forty years still lives; he lives in Albion; he has lived to very near his allotted three score years and ten; he is strong and vigorous and might be held up as an incontrovertible argument against the necessity of baths and bathing. We are not quite ready, however, to follow his practice with the hopes that by it we might make sure of certain health and long life; rather will we trust to the efficacy of frequent and thorough

baths. It is to be said of this man that he lives in spite of his uncleanly habits.

Wonders will never cease; the man who has drank water all his life which has been contaminated with filtrations from cess-pool and privy vault, still lives; he has never had the scarlet fever or typhoid fever; he also is strong and vigorous, so vigorous as to give loud and vehement protests against any one who suggests that the water in his well is not as pure as it ought to be, and that measures ought to be taken to obtain a supply from some pure source. The water from the majority of wells in Albion contains more or less of gross impurities, is impregnated with leachings from human and other animal excreta, and yet the majority of the residents of Albion are in comparatively good health. The same might probably be asserted of the majority of wells and of the health of the people of Michigan. From a consideration of these facts the usually conservative person might readily construct an argument, that to him would be unanswerable, against any need of outlay of public or private moneys for the improvement of the water-supply.

Again, our prejudices against the consideration of such a proposition are born of still more silly and indefensible reasons. "The water in *our* well is pure; we know it; it tastes better than the water from any other well in town; it is clear, and bright and sparkling." This opinion is held to all the more tenaciously if the owner has come into the possession of this well through his own toil and privations. If he only rents the place and desires to bring about a reduction of the rent it is a little easier to shake his faith as to its purity; if he has a grudge against his landlord, and especially if this has grown into a positive and open quarrel, he is then very positive that the water in that well is impure and will produce sickness and death. It is upon such foolish prejudices or preconceived notions that we judge of the purity of the water we are using, and upon such slight foundations do we base our selection of that fluid upon which the health, and even the lives, of our loved ones depend.

The eyes of the sanitarian look through other spectacles than these. He undertakes to pronounce upon the purity of a potable water by viewing the question in the light of well-known chemical methods, by a careful study of the death-rate, noting the surroundings, conditions and causes of the outbreaks of endemic and contagious diseases, peering deep down into the composition of the water with his microscope, watching the growth, development and reproduction of the minute forms he finds there, studying the effect which these forms produce upon lower animals, by the closest scrutiny of all the facts bearing on the question, by statistics, by the most acute and best matured judgment he can bring to the subject; by all these does he warn us that danger lurks in the water we drink. It is in such a spirit as this that we come at this time to the discussion of the present and future water-supply of our city.

The benefits to be derived from a good system of water-works are many. The first and most important of these benefits will be the ready supply of an abundance of pure water for cooking and drinking. For this the city of Albion has no need that would warrant the outlay of thousands of dollars unless it is proven to be a fact that the water already in use is badly contaminated, with no possibility of its becoming better as the years go by. The converse proposition is also true that no steps should be taken in this

direction until it is demonstrated beyond a doubt that a supply can be obtained which is perfectly pure and can be kept so.

To many persons the discussion of a water-supply suggests simply the above questions; but to those who look farther into the subject, many other decided advantages are brought to view. They see very clearly that in this lies the only possible solution of the question of sewerage, the means by which slops and garbage may be effectually disposed of, and the train of evils flowing from them avoided; they see a system of fire protection for the whole city, and legitimately growing out of this, decreased rates of insurance; they see a city made beautiful and attractive, with green lawns and brightly blooming flowers even in the hottest and driest summer season; all these and much else may be realized from a properly constructed system of water-works.

By many these latter benefits will be looked upon as luxuries, and all will agree that the question of the necessity for such works must largely rest back upon the purity or impurity of the present supply and the danger from disease and epidemics consequent upon using impure water for cooking and drinking.

What is the condition of the water which the people of Albion are using? This question we have tried to answer in the light of the principles laid down by our best sanitarians. The work has been done with great care, and the results can be relied on to give a reasonably correct answer to the inquiry.

Samples of water from thirteen wells have been analyzed, eight of these by the writer, in the laboratory of Albion college, and five in the physiological laboratory of the University of Michigan, under the direction of Dr. V. C. Vaughan. The water analyzed by Dr. Vaughan was taken from five wells which have been thought of as possible sources for a permanent supply for the city; that analyzed by us from some of the shallower wells. The map of the city, exhibited herewith, with the wells designated by black marks, shows that they are distributed over the whole city, so that the entire area within the city limits may be said to be fairly tested. Number 1 is the artesian well on Superior street, number 2 is the Warner spring, number 3 is a deep well on Porter street, in the third ward; number 4 is a well on the grounds of the Albion Manufacturing Co., number 5 is a deep well on Baptist Hill, and the remainder are wells owned by private citizens.

The results of the examination are shown in the following table:

Analysis of Water from Wells of Albion.

Sample Number.	Sensible Properties.			Parts per 1,000,000.								
	Clearness or Turbidity.	Color.	Odor.	Total Solids.	Chlorine.	Ammonia.		Hardness.			Nitrates.	Nitrites.
						Free.	Albuminoid.	Temporary.	Permanent.	Total.		
1, Artesian	.....	.....	.....	386	36.88	.228	.048	.....	.....	307	0	Minute trace.
2. Warner Spring	.....	.....	.....	309	4.5	.114	.042	.....	.....	293	.3	0
3. Parmeter	.....	.....	.....	305	4.5	.082	.052	.....	.....	293	0	0
4. A. Mfg. Co	.....	.....	.....	232	5.6	.088	.054	.....	.....	243	.75	0
5.	.....	.....	.....	580	37.89	.096	.062	.....	.....	279	.15	0
6.	.....	.....	.....	600	28.6	.022	.12	.....	.....	164.3	.....	Trace.
7.	Slight turbidity	Yellowish	Bad odor on standing	.....	40	.08	.26	100	100	200	.....	Trace.
8.	Considerable turbidity	Slightly green	Scarcely any	500	74.3	.12	.42	.....	.....	.....	.....	Much.
9.	Clear	None	None	228	7.14	.046	.24	28.5	114.3	142.8	.....	Some.
10.	Slightly turbid	None.	None	614	32.8	.08	.32	14.3	71.4	85.7	.....	Minute trace.
11.	Clear	Bluish	None	.....	32.8	.07	.14	.....	.....	157.1	.....	Minute trace.
12.	Clear	Slightly yellow	None	428.5	51.4	.08	.25	5	80.7	85.7	.....	Much.
13.	Clear	None	Slight	571	42.8	.066	.40	107	93	200	.....	Some.

Comparative purity of three samples of Water from Albion with other cities.

Warner spring	309	4.5	.114	.042	.....	.....	307	.3	0
Parmeter well	305	4.5	.082	.052	.....	.....	293	0	0
Albion Mfg. Co	232	5.6	.088	.054	.....	.....	243	.75	0
New York	118	3.5	.027	.27	.....	.....	32.8	8.325	0
Detroit	115	3.9	.045	.12	.....	.....	.....	.....	0
Philadelphia	143	3	.01	.18	.....	.....	47.1	6.845	0
Boston	85	3.1	.132	.60	.....	.....	15.7	12.3	0
Rochester, N. Y.	100	1.9	.015	.23	.....	.....	59.3	6.2	0
Liverpool	77.4	22.2	.....	.....	.....	.....	.....	.00	0
Ionia, Mich., 1883	300	8.5	3.00	.15	.....	.....	214	9.2	0
Washington	115	2.7	.06	.27	.....	.....	54.3	8.3	0
Order *	.....	10th	7th	6th	2d	.....	.....	8th	1st	.....

STANDARDS.

1. No absolute standard of purity can be given, but good authorities say—
2. The chlorine ought not to exceed 10 parts per million.
3. The free ammonia ought not to be more than .05 parts per million.
4. A water may be considered pure with .05 parts or less of albuminoid ammonia per million.
5. If .10 parts of albuminoid ammonia are present, it is a suspicious sign, and
6. If .15 parts are present in a million parts, the water ought to be condemned.

* Order of purity of Parmeter well in respect to substance or quality named at the head of the column.

Special attention is called to some particular features of this examination.

CHLORINE.

Among the more important tests made, were those which proved the presence and estimated the amount of chlorine present in each sample. Seventy cubic centimeters of the water to be tested were placed in a white porcelain dish, a drop or two of potassium chromate and a measured amount of a standard solution of silver nitrate* were added, such that, when precipitated by the chromate, it would require a milligram of chlorine to dissolve the precipitate formed from one cubic centimeter of the silver nitrate solution. The number of cubic centimeters of the silver nitrate solution used would therefore, without any further computation, determine the number of grains of chlorine per imperial gallon.† What is the significance and what the value of such a test? As is well known, chlorine as an ingredient of common salt, is disseminated through the soil almost everywhere, and will therefore be found dissolved to a certain small extent in all classes of water. This may then explain the presence of some small portion of that found, but when it is found in excessive amounts some other explanation must be made for it. In such cases the salt must have been accumulated by some means and poured into the water. Now the human body is an apparatus which is doing this very work. Demanding, as it does, salt to be associated with all the forms of food given for its nourishment, it finally passes off the same dissolved in its liquid excrement, the urine. The privy vault will therefore contain large quantities of salt. If, now, there is a possibility that sewage from this receptacle can make its way to the well, the presence of the salt in the well water is explained. Conversely when we find the chlorine in the well water we conclude that it has some communication or connection with some such source of contamination.

No absolute standard of purity can be established by which to judge of the amount of chlorine in a water in excess of that which the soil naturally contains. Of a dozen wells examined in a city, it might be fair to consider the smallest amount found in any of the samples as an index of the amount naturally in the water, and, by comparing the others with this, an estimate could be formed of the extent of the contamination from other sources. By reference to the table it will be seen that samples number 2 and 3, each contain 4.5 parts in a million, while the others contain from two to eighteen times as much. Prof. Wm. Ripley Nichols in his work on "Water Supply," p. 33, says that "where it is known to be the fact that the quantity of chlorides in the uncontaminated water is very small, the presence of any noticeable amount of chlorine (say much more than 10 parts in 1,000,000) indicates contamination from human sources." Taking this standard as a proper one for the waters of Albion, it will be seen that out of the thirteen samples examined only Nos. 2, 3, 4 and 9 fall below the standard, and can be regarded from this standpoint as a pure water.

AMMONIA.

Tests were also made for "free" and "albuminoid" ammonia. In these tests the method known as the "Wanklyn process" was employed. The

*Made by dissolving 4.79 grains silver nitrate in one liter of water.
†This method is probably not as accurate as that by ammonium cyanate, Volhard's Method. See Mallett's report to National Board of Health, 1882, p. 261.

object of these tests was to discover the amount of decomposed or decomposing organic matter contained in the water. Organic matter may be either of animal or vegetable origin, and when present, and not in a state of decomposition, may be harmless enough; but during decomposition, or after this has taken place, its presence imparts very dangerous qualities to the water. Especially is this so when these organic matters are proven to be nitrogenous in their character, as this is strong evidence of animal sewage.

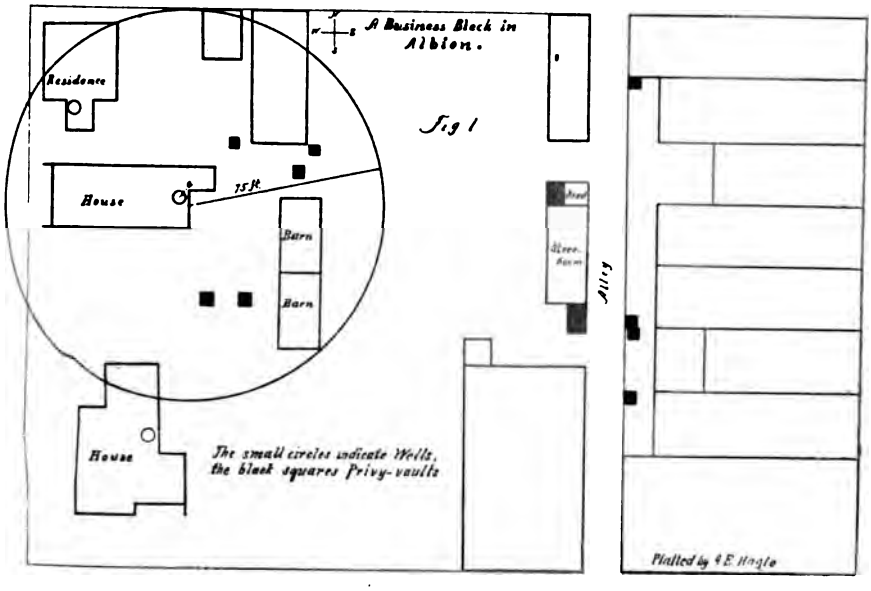
By the Wanklyn process, certain nitrogenous organic matters may be changed to ammonia by heating them in the presence of a strongly alkaline solution of permanganate of potassium, and the ammonia thus produced may be detected and measured by the proper tests. "The value of the method lies in the fact that it is the nitrogenized organic matter which is generally considered to be the chief source of danger in polluted water."

The danger does not always lie in the direct action of these organic matters upon the system, although in this respect they are undoubtedly very harmful. The longevity of the race would be greatly increased by drinking pure water. During the seventeenth century the average man only lived twenty-four years; this average age was increased during the eighteenth century to twenty-nine years; during our century the typical man lives to the age of forty-nine, while sanitarians are agreed that we ought to live a round hundred years, and that by properly living we could do so. Unpolluted water would greatly contribute to that end. There is, however, a still more serious side to this question; the origin of many diseases in minute, living, organized bodies, called by the general name, disease germs, is a well settled scientific fact. These germs find the proper condition for their growth and multiplication in water impregnated with decaying organic substances. They will not grow in pure water. Typhoid fever, a disease which numbers more fatal cases in Michigan than any other save one, is known to spring from a germ which, oftener than any other way, is distributed by means of polluted drinking water. The contaminated water, therefore, which we are drinking here in Albion, may not be fraught with danger so great as to bring about a fatal condition by reason of its present impurities, but should the germs of an infectious disease be introduced into these wells, or into any place having communication with them, they may and will eventually find their way into our systems. Herein lies our greatest danger, and the people of Albion at all times stand on the verge of a possible and fearful spread of some disease which will prove as destructive for us as, under conditions exactly like ours, it has been to many another place.

Referring again to the table of analytical results, it will be noticed that both free and albuminoid ammonia were found in every sample analyzed, thus proving the fact of pollution. As in the case of chlorine, it is very hard to establish a standard of purity by which to judge of the quantitative results. Wanklyn's own interpretation of the results of the ammonia process is essentially as follows: "If a water yield no 'albuminoid ammonia,' it may be passed as organically pure, despite much free ammonia and chlorides; a water giving less than .05 part of albuminoid ammonia in 1,000.000 parts may be regarded as pure. A water containing .05 part of albuminoid ammonia, together with a considerable quantity of free ammonia, is suspicious, but, in the absence of free ammonia, the albuminoid ammonia may be allowed to amount to something like .10 part; above .10 part should be regarded as very suspicious, and over .15 part per million should condemn the water."

By comparison of these standards with the results obtained it will be seen that only in two cases does the amount of albuminoid ammonia fall below the standard of .05 parts per million, while it exceeds the limits at which a water should be discarded in six samples of the water analyzed.

It could not be otherwise than that, in a place like ours, where the cess-pool, privy-vault and well have been associated together on the same small lot, four rods by six, for twenty-five years or more, ready communication between these places should have long ago established a route by which not alone the common impurities may make their way into the well, but also a route which, at every point, furnishes abundant nourishment for any disease germs which might accompany this filth. Consider, for example, what chance the well marked (a) in the accompanying plat, fig. 1, of a business block in the city of Albion has of maintaining its purity. Estimate the probability that the water in wells *b*, *c*, *d* and *e* of fig. 2, will continue in a pure state, when in the circle of only 75 feet radius there are several vaults, pig-stys, manure heaps, etc.

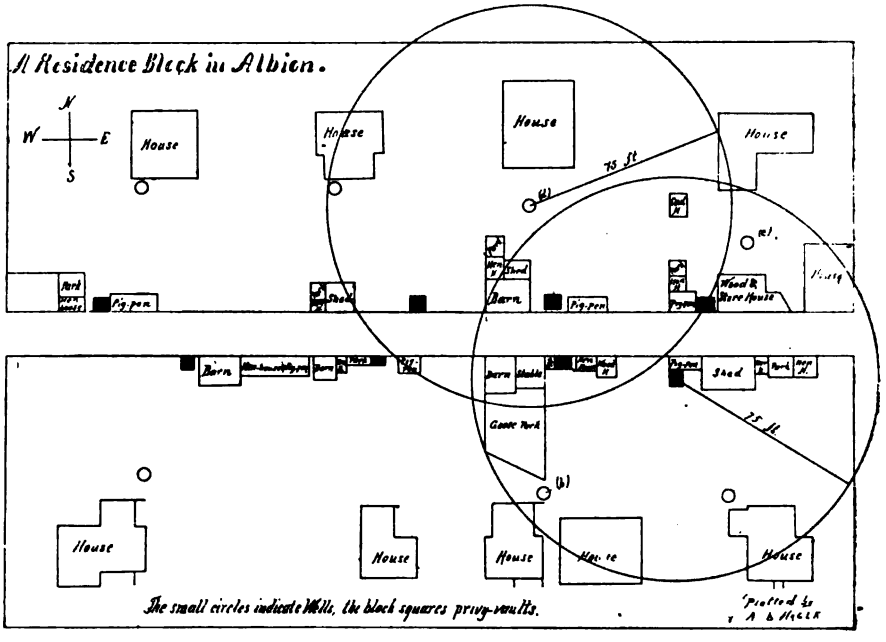


HARDNESS.

The water of Albion is very hard. Drinking water may contain as large a proportion as 700 or 1,000 parts in one million, but a much larger quantity renders it unwholesome. Croton water, the supply of New York city, contains only 64 parts per million; the Ridgewood water of Brooklyn holds even less, while the waters of Saratoga contain 4,280 parts and more per million. The average of the thirteen wells in this city whose water has been analyzed is 188.5 parts per million.

Finally is presented a table (p. 16), in which is compared three samples of Albion water with that used in some of the larger cities of the country.

It will be noticed that the waters from outside our own State contain much less of total solids, chlorine and hardness, but on the other hand they run much higher in albuminoid ammonia and nitrates.

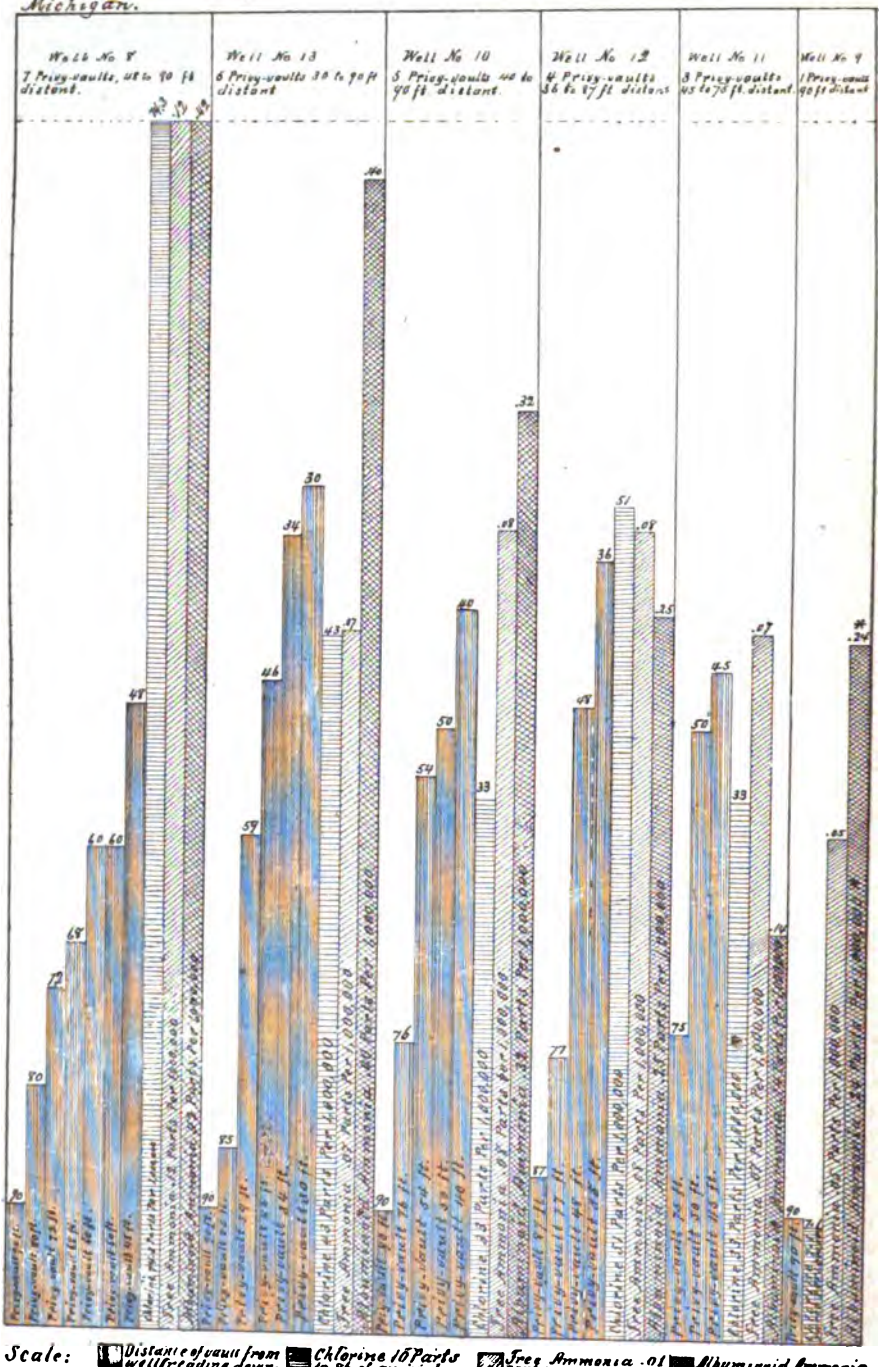


CONCLUSIONS.

I suppose I may reasonably be expected to give an opinion as to the legitimate conclusions reached by this investigation. What value shall be placed upon it? How much of real danger lies in the continued use of this water? It is a fact, as was stated at the outset, that we have been drinking this contaminated water for years and yet enjoy comparatively good health. This is a fact, and no amount of theorizing will set it aside. On the other hand, shall we ignore the results of this analysis as so much time and labor lost, and continue on in our fancied security? This question I have tried to answer by a careful study of all the authorities accessible by me I have studied especially the report of that great work done by Prof. Mallett, under the direction of the National Board of Health, a work undertaken for the express purpose of determining the value of this kind of work, as enabling the chemist to ascertain the question of danger or safety in the use of a water; and while he concludes that the chemist can not, by his investigations alone, declare that there is immediate danger in the use of a given sample of water, —that he must call in the aid of the microscopist and biologist, still he agrees with others that the chemist is competent to establish the fact of pollution; so that (and I want to repeat what I consider is the great danger to us here in Albion) the germs of disease may make their way into the well water by the same route which the contaminating material has taken. The water in most of our wells is contaminated. There is no doubt of that.

There is therefore direct communication between these wells and the source of the pollution,—this source being the natural receptacle of the excreta from some member of our own or neighbor's family, who may happen to be taken with some communicable disease. The danger, therefore, is a real one, and demands immediate and vigorous measures for its removal.

Diagram .. Exhibiting the Relation between the Number and Nearness of Privy-vaults to Wells, and the dangerous Impurities in the water in those wells, in Albion, Michigan.


Well No 8
7 Privy-vaults, 18 to 90 ft distant.
Well No 13
6 Privy-vaults 30 to 90 ft distant
Well No 10
5 Privy-vaults 45 to 90 ft. distant.
Well No 12
4 Privy-vaults 36 to 87 ft distant
Well No 11
3 Privy-vaults 45 to 75 ft. distant
Well No 9
1 Privy-vault 90 ft distant

Scale: Distance of vault from well reading downward 10 ft. to .64 of an inch. Chlorine 10 Parts to .86 of an inch. Free Ammonia .01 Part to .53 of an inch. Albuminoid Ammonia .10 Parts to 1.52 inches.

*Albuminoid Ammonia in well No. 9 is believed to be due to surface drainage

Prof. V. C. Vaughan then gave an unwritten address on the subject of Water-Supply. He spoke something as follows:

DISCUSSION OF THE SUBJECT OF WATER-SUPPLY.

BY PROF. VICTOR C. VAUGHAN, M. D., PH. D., MEMBER OF THE STATE BOARD OF HEALTH, ANN ARBOR.

I suppose, if we were supplied with pure air, unadulterated food and uncontaminated water, there would still be room for doctors and undertakers, but disease would be greatly decreased, suffering lessened and life prolonged. It is a law applicable to all creatures that when compelled to live upon their own excreta they sicken and die. This is true of the most minute organism. It is true of man.

The most prominent of English historians has said: "The only real knowledge is that which can be converted into practical power. It is the only knowledge that has life and growth in it. All else dries up like the rain drop off the stones, or hangs like dust about the brain." Let us make this discussion as practical as possible.

There are three different sources from which we can draw our drinking water: Cistern water, surface water, and subterranean water. The purity of cistern water will depend on the atmosphere through which it falls, the roofs upon which it falls and the cistern in which it is collected. It is more likely to be contaminated by the atmosphere in manufacturing districts than in Michigan. Great attention should he given to the roofs where leaves, branches of trees and the excrement of birds are likely to accumulate. The only way to keep the cistern itself free from contamination is to build it so well that no water from the surrounding soil will be allowed to enter it. To do this the excavation should be one or two feet larger than the cistern. Several cases of typhoid fever have been known to come from the use of cistern water. In one case a cistern was used which was surrounded by numerous privy vaults. The cistern leaked, and if water can leak out it can leak in. What effect would it have to filter the cistern water? This depends upon circumstances. The ordinary filter is a delusion and a snare. Charcoal filters do not free organic matters. Organic matter collects in the filter and it becomes a hot-bed of disease.

The purity or impurity of surface water will depend on the atmosphere through which the water falls, and the soil through which it flows. A few years ago I visited a city in this state to study the water-supply. It was gathered from the hills which were studded with stables, pig-pens, and all kinds of impurities. It was washed down into the ravine and then into a pond from which the supply was obtained. Typhoid fever prevailed in this locality to a great extent. Surface water may be very pure. This is true where it falls on a surface unpolluted, and where the volume of water is large. The great volume causes a dilution. Most large cities use surface water, and this has all degrees of purity and impurity. Detroit has a fairly pure supply from the lake. Some cities have suffered greatly. This is true of Philadelphia. During the centennial exposition, the contents of the cesspools passed into the river, then down a short distance into the water supply, and there was a great prevalence of typhoid fever. Some suppose that

flowing water will purify itself. There may be a grain of truth in this, but germs have been known to be carried a long distance and still continue poisonous. The citizens of Trenton and Wyandotte have been complaining of the contamination of their water-supply by the city of Detroit. Garbage has been carried down the river, and Trenton and Wyandotte have suffered greatly from typhoid fever. It is probable that a large stream of sewage may be carried a long distance without being distributed, because of its different temperature and different specific gravity. This is illustrated by the Missouri and the Mississippi. The Missouri is muddy and still remains muddy after running into the Mississippi. This principle is also illustrated by the gulf stream, which retains its warm temperature and does not become admixed with the water of the ocean. So the probability is that if one city pours its sewage into the river, the city below will drink this sewage.

The purity of subterranean water depends on the purity of the soil through which it percolates. The popular idea is that percolating water purifies itself. This has been demonstrated to be a sad mistake. This is especially true of the sandy soil in this State. The distance organic matter will pass through a soil and still maintain its virulent properties, is remarkable. (Dr. Vaughan here referred to experiments made in Richland, Kalamazoo county, showing that lithium sown over a proposed cemetery passed to a well thirty rods distant. He also stated how the germs of typhoid fever had been carried through a mile of porous soil in Lausanne, Switzerland.) Subterranean water will never be pure unless it passes through a pure soil. You can't have pure water as long as you have privy vaults and cesspools, and if there are any disease germs in your soil they will find their way into your well.

It is known that cholera is spread by bad water. Where do we find the home of cholera? In India. Why do they have it in India, and why so constantly? Every few years the people of India hold festivals. They make pilgrimages a thousand miles on foot. The festivals occur in the hot months, just before the rains. They only eat meat that has been blessed, and after being blessed not a bit of it is thrown away. They are crowded in huts. They travel in small bands. They use the banks of rivers when obliged to obey the calls of nature. Disease and death make great havoc among them and their corpses are buried in hills scooped in the sand. Cholera invariably breaks out, and the streams become contaminated with the cholera germs.

We shudder at the ravages of cholera, but let us come nearer home. Typhoid fever slays its hundreds where cholera slays its tens. Every death from typhoid fever is unnecessary. If the soil were not contaminated, none would occur. Yet there are 1,000 deaths from this disease in Michigan each year; and for every one who dies ten persons are sick, and not a case is justifiable. Typhoid fever comes to those in the prime of life. Each patient is sick on the average about four weeks, and there are ten thousand sick during the year. This means not only a great loss of wages, but a nurse is required for each person sick, so that twenty thousand people give up their entire time to this disease four weeks out of each year. You may keep your premises clean, but only a little fence separates you from your neighbor, and he may be careless. If that neighbor should knock you on the head in a dark night, he would be sent to prison, but he may contaminate your well, and rob you of you life and your family, and you do nothing. The time will come when it

will be a criminal offense for any man, through carelessness, to give his neighbor a communicable disease.

During the past fall typhoid fever prevailed very extensively at Iron Mountain in this State. One of the physicians at Iron Mountain said that the people there were drinking the foulest water he ever knew people to drink. A sample of this water was sent me. After putting it in beef tea and keeping in an oven eight or ten days, the residue was injected in a cat's back and the temperature rose in twelve hours from 99 to 104 degrees. This could not have been due to the cat's mind; it must have been due to the germ.

Some time ago a convention was held by the State Board in one of your neighboring cities, where the wells as a rule were only ten feet deep. The ground was honeycombed with cesspools. We earnestly pleaded with those in attendance at the convention that they would boil the water which they used. Yet in less than a month several who listened to the speeches were dead from typhoid fever. Do not regard what is said here as only talk. You are in danger of having typhoid fever so long as you have wells and privy vaults. Until a system of sewerage is introduced you should substitute for the privy vault the dry earth closet. Next find a good water-supply. I would advise you to employ some good civil engineer, pay him and have him investigate the different sources of supply. Then decide where the water shall come from. Then get bids from different water companies. In Ann Arbor we paid a civil engineer two hundred and fifty dollars, and we now pay only forty-five dollars a hydrant.

The following paper by Wm. C. Conant of New York, was then read by Hon. R. L. Warren, of Albion:

A PUBLIC WATER-SUPPLY.

BY WILLIAM C. CONANT, EDITOR OF THE SANITARY ERA, NEW YORK.

I take it to be now past debate that the water of wells is dangerous to health and life in any city or village, or even in the neighborhood of any habitation of man or domesticated animals, unless all underground channels leading to the well are traced and guarded, or unless all personal and domestic waste is converted into wholesome soil. Both of these alternatives are but partially practicable in communities, and therefore "the wells must go." Artesian or deep-driven wells are scarcely to be excepted, because it is in comparatively rare places that sufficient water for the whole community can be obtained from them at a cost tolerably proportioned to the wealth of the community, and also because such wells are oftener than otherwise charged with an unacceptable mineral element, and because all the successive veins of water, penetrated by pipes, find a conduit by the pipe surfaces to the bottom intake, however contaminated they may be from unknown sources, or may casually become at any time.

There remains, therefore, for the collective supply of towns, such as this, no usually adequate source but lakes and streams. But how can this surface drainage of the rainfall, gathered from far and wide, with its innumerable

and inevitable occasions of pollution, regular and casual, be fit aliment for man? There is but one answer: it never can be. Those who are accustomed from childhood, like the writer, to drink only from the isolated wells or living springs of a sparsely settled region, had never thought it possible to drink river water, nor would even stoop to the clear water of a young mountain brook, unless compelled by uncommonly urgent thirst. Among laborers by the margin of a wild stream, I often and invariably went miles away from it to bring pure water for myself and them; for the poorest man would not touch river water, though better than any of our great and opulent cities are able to supply their palaces with! We considered that water fit only for cattle, and so it was. The fact is, that surface water is generally made for the beasts, and adapted sufficiently for their less important security; but man is appointed to dominion over nature, not dependence on her, and must take care of himself, if he would be taken care of as he deserves to be. He is not to take, like a brute, the drink of the brutes. He does not need to do it. The secrets of nature, hidden from brutes and beyond their control, are open to man's inquiry and subject to his use. Among the most beneficial of these secrets we find the processes by which the impure drainage of the lands is "curiously wrought in the lowest parts of the earth" into the model water of those rare deep wells and springs that some of us have known so well; like that "well of Bethlehem" for which King David pined in his royal exaltation.

It is true that this recondite process has but lately come to light, and that many learned men and sanitarians have not yet found time to turn their attention to it. It is true that gross misconceptions of the philosophy and the art of water purification according to nature, are still rather the rule than the exception, even among otherwise enlightened men; yet it is also true that we have at last grasped the principles and successfully translated them into practice; not only on the small laboratory or domestic scale, but also on the gigantic measure of city supplies that drain a lake where a ship might sail, every twenty-four hours. As, in the printing vaults of a great modern journal, streams of pure white paper hundreds of miles long daily pour into the machines and rush out of them at railroad speed, printed all over with the news, literature, science and thought of the hour from all the world; so the slow and dispersed processes of nature's subterranean waterworks are elsewhere reproduced for turbid streams that rush through ranked machines with the aggregate volume of a river, taking in its passage, by the marvelous mechanism of human art, all the identical agents, operations and effects that make the crystal water of our most famous wells or bleachery of springs.

I saw but to-day a glass jar of water flashing with the purest translucence of a "white diamond," side by side with another jar of the *very same* water in its natural condition, opaque with dirt, and with a black flocculent sediment half an inch deep at the bottom. The first jar was but the second regenerated by nature's finest art, which man had not only imitated but enlarged. This happens to be but the work of a small group of purifiers for a paper mill in Connecticut, taking in a mill stream of dirty water and passing its unchecked torrent out in this crystalline splendor of purity; but in other places this is doubled and quadrupled for city supplies, and capable of unlimited further multiplication with the same effect. It is more than a year since I first saw this done with the muddy water of the Raritan river in

New Jersey, and the same had then been going on there a year uninterruptedly, for the supply of two cities, and it is going on there still.

It is quite natural to ask, "How can these things be?" and the question is now an easy one to answer. A description of the purifying process that sends from foul and muddy streams pellucid rivers, at whose bottom you might read a newspaper, through the streets of Raritan and Somerville, N. J.; Oswego, N. Y.; Raleigh, N. C.; Atlanta, Ga.; Charlestown and Huntington, W. Va.; Belleville, Ill.; Bucyrus, O.; Eau Claire, Wis., and a dozen others that I could name,—would differ in nothing, but compacted and controllable mechanism, from the purifying process of nature by which just such foul surface drainage, after passing through the soil and deeper veins of the earth, reappears at some peculiarly favored point in a spring or well far famed for purity and sweetness. That process has been found out, and adapted in an artificial system identical in its principles, agencies and results, and as competent to the continuous supply of New York or London with the purest of water, as the streams that form the Hudson and the Thames are to supply those cities with the dirty and dangerous surface drainage that their dainty people are drinking like the beasts that have used it indiscriminately as their drink, bath and general conveniency before them, to say nothing of the sinks and sewers of human waste that constantly contribute to its ingredients.

How does nature get rid of all this filth in surface drainage? All water, even of the finest wells, is foul surface drainage at one stage of its progress. The freest drinker of brute's water and sewage among the elite of Boston or of Philadelphia would hardly smell at your fine spring water at the moment after it has soaked through the fat surface soil. And yet, at that moment, the discolored and odorous liquid has just been permeated with an element from the soil, that in a moment more is to prove a healer as magical as the tree that the Lord showed to Moses, or the salt of Elisha's cruse. You can scarcely thrust a spade through the soil anywhere without striking aluminous clay, either in a distinct or an undistinguishable form. For what purpose is this ingredient so universally distributed? There is scarcely a more notable evidence of creative and beneficent design in all nature than this ubiquitous provision of aluminous clay, for the office of purifying the drink of man by extracting from it nourishment for vegetation.

Water is the grand solvent and carrier of the materials of spent life back to the dust from which it was made and to the fresh organisms in which it is to reappear. Various metallic salts are distributed through soils to aid in disengaging the dissolved or more intimately suspended portion of these materials of life, and putting them into condition to re-enter the cycle of active existence through the roots of plants. But of all these, the particular salts of aluminum and potassium that enter into the clay of the soil, are so predominant in extent and utility as to represent, perhaps, for a majority of cases the substantial factor in the transfer of organic materials from their vehicle, water, to their receiver, the plant; or rather, from that much of the vehicle which is to go away purified for a higher office in the constitution of man, to the residuum that is to remain suspended in the soil, to be drunk up with its contents into the lower form of life,—vegetation. This disengagement and coagulation of the impurities that are found practically united with all surface water, is essential to effective filtration; and it is the essential secret of pure water in nature, that was so long hidden from science.

Below the soil or other stratum in which the percolating water strikes aluminous clay, it usually strikes some kind of fine, compact sand or gravel, or porous rock, through which it soaks, leaving behind its now detached foreign ingredients, including, as many testimonies indicate, the most, and sometimes all, of its living organisms.

One more operation, so far as we know, now perfects it, where the highest quality of natural water is attained. Whether more or less aerated from the oxygen-charged interstices of carbon, and in its diffusion through the superficial strata of the ground, the water that has the good fortune to find its way to great depths in the veins of the earth, becomes subjected to an atmospheric pressure, perhaps while in a finely divided state, and absorbs oxygen largely in excess, it is said, of the proportion it is capable of receiving under ordinary pressure. In this way, the faintest traces of organic matter that may have escaped the coagulant or the filter, are liable to be consumed, and the perfected water finally breaks forth at its outlet in the most admirable condition. Not more admirable, however, than anyone may see it in, on any day, breaking forth at the outlet of a compact imitative process precisely the counterpart of that in nature which I have described. Pressure exceeding that of our deepest pure water veins is (or may be) applied by water gravity or otherwise, to charge the water to be purified with a large percentage of air as it passes to the filters. The same coagulant that nature uses is injected, in the same or more accurate proportion, and in its pure manufactured state, into the water as it rushes through the supply pipe. The quantity necessary to diffuse itself to every particle in the mass is marvelously small, and would not be detected even by a chemist, if it were to remain in the water. But in fact, the impurities coagulated are inseparable, of course, from the coagulant, that unites with some of them chemically and with others mechanically, and is detained with them in the meshes of the filters. Both practical experience and chemical demonstration (the latter on the authority of Prof. Austen of Rutgers College) prove that so small a quantity as one-sixth of a grain of alum to the gallon of water is sufficient to permeate the water with complete effect, and to permeate it instantly! Before me stand at this moment two jars of water from the Raritan river; one from the inflow pipe, of the color of muddy vinegar, with copious dark brown sediment on the bottom; the other from the outlet of the filter, at the same moment, after having been treated with one-sixth of a grain of the coagulant, and transmuted in the filter to the purest crystal conceivable. This is but the daily and hourly delivery to the houses of the two cities, year in and year out, without variation, whatever the state of the river. Exactly such water as this, without the faintest taint of odor, was delivered all that day last July when millions of gallons of oil, from a burst pipe line a few miles above the works, were pouring down the river, churned into the stand-pipe by the pumps, and covering all the inside of the apparatus with a loathsome mixture of mud and grease. No user of the water got a suspicion of what had happened.

The carbon of the soil is richly represented, together with the finest sand, four feet deep in the filter; and the purification of nature's sand filters, near their surfaces, by the roots of plants absorbing the exfiltered impurities, is improved upon by daily thorough scouring and rinsing of the *entire* mass by a reversed and upward pressure current of water so strong as to carry the sand up from its bed into a chamber above, in a state of suspension by agitation. After ten minutes of such clashing and rinsing, the water begins to

run off clear, the regular current is restored, the sand and carbon returned to the bed, and filtration is resumed.

Since lakes and streams are in general the only sufficient supplies available for cities, large and small, the recent perfecting of the process of purification is an indispensable and an immeasurable boon to humanity. Your city need not go far for ample supplies of water that can now be made, at small cost, equal to the best ever drunk from "the old oaken bucket that hung in the well."

Third Session, December 7, at 10 A. M.

The Convention was called to order by the President.

The first paper was by Dr. R. A. Martin, on the subject of "Nuisances: What they are and how to prevent them."

NUISANCES: WHAT THEY ARE AND HOW TO PREVENT THEM.

BY R. A. MARTIN, M. D., OF ALBION.

In considering the subject assigned me, it is to be presumed that I am to confine my remarks to such nuisances as all must recognize to be such, and especially to those that are inimical to public health. I hesitate not to say that to us as citizens of Albion the most important are the abominable privy vault and cesspool, reeking with filth and odorous with decomposing gases. The disposal of the excreta of the human body is a subject that has elicited the earnest thought and attention of humanitarians and sanitarians for years. It is the great problem of all large cities, whether seaboard or inland, whether so situated that they can take advantage of the ebb and flow of the tides, if that be an advantage, which is doubtful, or whether they are situated on the shores of the great lakes or by streams flowing in one direction. But we wish at this time to consider the condition and means of improvement in Albion.

It ought to require no argument to prove the objectionable features of the vault or ground storage system, especially in a city fifty years old and containing 4,000 people. The privy vault is indeed an objectionable thing in the country with but six or eight families containing from twenty to forty persons to the square mile of territory. If this be true (and who, that gives it thought, can doubt it?) how much more of a nuisance must it be in a city where for years and years there has lived a family of from four to eight persons on each lot four rods by six, or in other words a population of 3,000 or more to the square mile, all depositing the waste of their bodies, together with very much of the refuse of the kitchen in the way of decaying fruits and vegetables, decomposing scraps of meat and greasy dishwater, together with the excreta of hundreds of horses, a few cows and some hogs, all so disposed of that it shall soak into, saturate and contaminate the ground of this square mile,—and yet from this same ground and in close proximity to the cesspool, privy vault and manure heap we draw our supply of water for drinking and culinary purposes. Do you like the picture? You who pride yourselves on your cleanliness and detestation of dirt and filth, and you who

would shrink in dismay from exposing yourselves or your loved ones to the risk of contagion or disease! But am I not an alarmist? Is there any danger of contaminating the water in wells dug to a sufficient depth, or it may be penetrating the rock itself? There is no more common as there is no greater error than the presumption that percolation through twenty or thirty feet of soil and gravel or even a hundred feet, entirely and certainly removes all objectionable matters from water, both chemical and organic. The truth is that deleterious chemical salts, and also living germs of such dangerous diseases as typhoid fever, scarlatina, cholera, etc., may be carried long distances through the ground and make their appearance with all their disease and death producing power where and when you least suspect them. Then, as to wells bored into the rock, if water is found there must exist some crevice, some fissure, however minute it may be, between the strata, and the strata of rock run in a more or less oblique direction and must approach the surface somewhere, it may be under some one's privy vault or hog pen. Do not understand me as asserting that percolation is not a purifying process, but I do assert that it does not secure absolute immunity. It is not always the nearest vault that contaminates the well, though the nearer the vault the greater the danger. The obvious truth is that there can be no safety while vaults are allowed to remain and be used in the city. That there has not hitherto been a case of sickness which to your knowledge was directly traceable to contaminated water is neither any proof that cases have not occurred or that they will not occur in the very near future. In whose family the first case will occur it is impossible to tell. That we are all in constant danger so long as the present system prevails, I am sure.

There are two ways of abating this evil. One is a system of sewers that shall reach every dwelling in the town. To this system there are three fatal objections.

(1.) Its cost. Even were the city to incur the expense of building and maintaining the mains, it is to be done by means of increased taxation, and then there are many householders who would find it beyond their means to put in the connecting sewers or pipes,—moreover a sewer connection is worse than useless without an abundance of running water for flushing purposes.

(2.) A second objection is the failure of the sewer to overcome the evil or remove the danger; on the contrary, while the sewer but partially overcomes the objections to the vault, it introduces a new danger peculiar to itself. Drains are useful for the disposal of surface water only, and the introduction into them of human excreta with the water (converting them into sewers) leads to putrefactive changes, producing foul gases which pervade the sewer-connected house and give rise to the same class of diseases as does the privy vault.

(3.) A third objection to the sewer is the emptying of its contents into the river within the city limits. Indeed the present sewer discharges its contents into the river in the very centre of the city and immediately under the point of greatest travel during business hours. But even if it were carried entirely below the built-up portion of the city (a thing almost impossible to do) it would still be reprehensible in the highest degree, and a constant menace to all the towns below. The practice of pouring the contents of drains into our rivers to be carried by our neighbor's door contaminating his possible supply of water for drinking purposes is a piece of vandalism that should be made a crime by legislative enactment.

The other, and by far the better method of disposing of human waste is by what is known as the "dry earth system." This can be accomplished by the use of what is known as the dry-earth closet, or, if needed for use in the sick room, the dry-earth commode. The same principle can be easily and successfully applied to the outhouse now in such general use, by thoroughly disinfecting or better still removing the contents of the vault, filling up the pit and covering it with a tight board or better with a cement floor. On this floor can be placed galvanized iron pails, or even wooden pails or boxes, which will admit of easy removal for the purpose of disposing of their contents, or, if the floor be made of cement, it can be used, and the contents removed with a shovel; in either case the rear must be fitted with a trap door. This would require that the dry earth, ashes or other deodorizing absorbent should be applied daily by hand. In the regularly made dry-earth closets the application of the deodorizer is made by a mechanical contrivance operated either by the weight of the person or by means of a lever. In either case it is necessary that the receptacle be emptied of its contents once or more a week, the frequency depending upon the number using it. The perfectly deodorized, disinfected, practically absorbed material may be stored in barrels, strewn upon the garden or gathered into a cart and removed to the farm for fertilizing purposes, it being by this process rendered perfectly inodorous. In London it is estimated to have a commercial value of £3 per ton. The dry earth system is adapted to universal use. The home-made arrangement is not only cleaner and healthier but cheaper than the vault system, while, if desired, regularly made closets can be used in wood-house, bath room, sick room or cellar. [*]

In Omaha it was, and, so far as I know, is now the custom to place dry earth closets for the use of the employés of the business houses under the sidewalk, and I am assured by those who used them that they were perfectly odorless and unobjectionable. I personally know of the use of a dry earth closet in the room of an invalid for two years without the slightest perceptible odor or inconvenience, indeed I think but few persons who visited the invalid knew what it was, as it was made of oiled walnut and was quite a nice looking piece of furniture.

Attendants upon this Convention have an opportunity to examine Heap's "Dry Earth Closet," made at Muskegon, in this State, and said to combine all the excellencies requisite to a perfect earth closet, and the manufacturers point to numerous testimonials and their rapidly increasing sales as evidence thereof. That the dry earth system is a success and easy of universal application I consider beyond dispute. I think it should be adopted in this city without unnecessary delay.

In close connection with the privy vault system is the open mill race in the rear of the business houses on the east side of Superior street. The open race would be bad enough and a nuisance that ought to be abated, but as it is at present used, it is not only a nuisance and a constant menace to the health of the city, but it is an outrageous disgrace which public decency

[*Dr. Martin seems to be an enthusiastic admirer of the dry-earth closet system, and goes further than do most sanitarians. The dry-earth closet is far preferable to the abominable privy vault; but the storing of excreta in dwellings or occupied buildings is attended with odors and dangers, and neither the dry-earth closet nor the water-closet should be in a sleeping room, but should be separated from any occupied room by a space which should be freely ventilated.—H. B. B. Sec. S. B. of H.]

demands should no longer be tolerated. The dry earth system offers an easy and complete solution of the whole matter. The wonder is that clear headed business men have endured it as long as they have, and it is equally surprising that the mill company have so long allowed it to be used as an open sewer, for that is what it is in fact.

There is another possible source of danger to which I wish to call attention, and that is the location of an extensive slaughter house, and also our beautiful cemetery above the source of our ice supply. Were I discussing the subject of the disposal of the dead I should feel free to advocate the only hygienic method, but at present I merely wish to direct attention to what may become a very serious matter. Ice is a necessity and should be as pure as the water we drink. Freezing water, so far from freezing organic matter, only imprisons it, to be released when the ice is melted, and the ease with which disease-producing germs may in this way be introduced into the system is too apparent to need elaboration.

DISCUSSION.

Geo. H. Green, M. D., of Marshall: Concerning the use of dry earth closets,—I can add nothing to what has been said except the necessity of educating the people. Typhoid fever and diphtheria are produced by a specific germ, not by filth. Filth acts only as a carrier of the disease. The house and surroundings may be filthy and yet the people may be in good health. The State Board of Health is doing all in its power to prevent these diseases, and by such conventions as these, by letter and otherwise, is giving instructions how to proceed in the abatement of nuisances. If we wish lives to be saved let us ask the Legislature to give liberal support to this Board. Too often nuisances are not abated, and diseases are not prevented, because we put in an ignorant man for health officer. Too often politics rule, and the man is elected who does the most political work. The local Board of Health has abundant power to order the removal of a nuisance and enforce its order. Cases have occurred where an appeal has been made to the law. There should be some power to declare what a nuisance is. Too often boards of health and health officers are afraid of making enemies.

Bion Whelan, M. D., of Hillsdale: In Hillsdale we have gone through the usual course in trying to rid our city of nuisances. Water-works in Hillsdale were the outgrowth of a sanitary convention held there. During the past year we have established sewers. We are situated on a little river; the land slopes both ways to it. Small pipe is used and the sewer connects about ten blocks. There is a flush tank at the head of each sewer which flushes it once in two hours. Sewer gas is not generated unless the elements which produce it have been in the sewer twenty-four hours at a temperature of 60 degrees. The ordinary small-pipe sewer is not expected to carry water from roofs. Here you could empty your sewers at a half dozen different points, or have one sewer deposit far below the city. Our sewers cost $2,300. Before that, the hotel had been in the habit of spending seventy-five dollars a year to keep cleaned out. Now the regular rate is $2.00 a year for ordinary dwellings, and there is practically no expense to the city. I should take exceptions to the paper where it is stated that sewerage is not desirable. The earth closet is good simply to supplement the sewer. The danger is that the earth closet will be adopted by families who will not give it proper attention. The laws of the State are ample to prevent nuisances. You must supplement them by city ordinances. Hog pens and cesspools should not be allowed in your city. As to your water-supply being let to a company, it would be better to build it yourselves and get the profit. In Hillsdale the rates are so low that poverty has not prevented any getting water, and the rates pay more than the full amount of running expenses. This is the result of a sanitary convention held in our city.

B. B. Bissell, of Albion: I visited our ice house last winter, and the stench was as strong as from weeds in the mill-race. I came to the conclusion stated last night that water is not purified by freezing.

Prof. Victor C. Vaughan, M. D., urged the necessity of boiling the water, as this would destroy the germs. In China they boil the water they drink, and cholera has never obtained a foothold there. This is a great contrast from its prevalence in India. The sewer of which Dr. Martin speaks is one kind, and that of which Dr. Whelan speaks is another. Dr. Martin refers to the old sewer which carries off everything, which is sort of an elongated cesspool. The sewer in use to-day is

small and flushed every two hours. Its value is unquestioned. People often complain that the health officer does not do his duty. Of course the health officer should enforce the law, but as a rule he is inadequately paid. A practicing physician offends his patients and is at a financial loss if he does his duty. It is asked if boiling the water before drinking does not render it insipid. This is obviated by exposing the water in shallow pans. Referring to the ice supply which had been mentioned, Dr. Vaughan cited an epidemic in an eastern city which was due to the ice supply. The germs had been found in the ice.

DISEASES INCIDENT TO THE POOR.

BY A. G. BRUCE, M. D., OF ALBION.

With most of the human race the struggle for existence begins very early. Even the fœtus is not always secure from the wicked infanticide. Infancy is surrounded by a host of enemies; the most innocent appearing among them is, perhaps, soothing syrup, and that alone is said to destroy annually in this country 15,000 babies. Childhood, adult life, and old age each have their dangers and their susceptibilities to certain diseases to contend with. Sex and heredity come in with their contributions to the burdens placed upon human shoulders. Latitude and topography have laws that are inexorable, and demand tribute of all within their reach. Affluence and poverty each set their private seal on most of their victims, so that they can dictate not only what they shall eat and drink and wear, but also with what diseases they shall die. It is with diseases incident to poverty that this paper chooses to deal, because they are largely preventable diseases and therefore come within the scope of sanitary regulation.

The safety of the human system and the preservation of health are influenced more by our environments than by heredity; and the essentials to health are clean ground, pure air, pure food and pure water. That the plat of ground surrounding the dwellings of the majority of the poor, narrowed down to the smallest possible limits generally, is *less* cleanly than that surrounding the homes of the wealthy none will deny. Let us notice some of the causes that conspire to produce this uncleanly condition. The majority of the poor live in rented houses; they move often, sometimes because their surroundings are unbearable, sometimes because it is cheaper to move than to pay rent. Whatever be the cause, the fact is that but little effort is put forth to beautify and purify their surroundings. Poverty compels them to live on the cheapest food. Instead of sirloin and porter-house, they have soup bones which after having done valuable service on the table, are scattered promiscuously about the yard. Such dwellings are seldom furnished with appropriate sewers; therefore the kitchen waste is thrown out the back door and sometimes the front door. Landlords owning houses to rent to the poor subdivide their lots in order to get more houses upon a given area, and the poor, in order to further economize their scanty means will crowd two or three families into one house, and as a poor man's wealth consists in the number of his children, often a dozen or more are seen playing on the sunny side of an old tumble-down house, thus rendering the growth of a lawn or shrubbery almost impossible. Thus year after year as families move in and out, each adds to the offensive deposits on and about the premises and none ever think of removing anything, until finally the land becomes saturated with the

products of decay and in the summer season becomes a hot bed of disease-producing germs.

Three-fourths of their natural lives, the poor breathe a vitiated atmosphere. In order to save rent often a family of half a dozen is crowded into two rooms, in which they eat and sleep, and to save fuel every crevice is closed and absolutely no ventilation is permitted during the eight or ten hours of sleep, so that in the whole sleeping apartment every cubic foot of air is breathed over again and again until it is so laden with carbonic acid gas that you can scarcely light a candle in the room. Something of this same impurity of the atmosphere continues through the day and is breathed continually by the mother and smaller children.

Much food that is cheap goes to the homes of the poor regardless of its quality or purity. They dare not throw away tainted meat, tainted milk or sour bread, for they have not means to buy better.

We now come to consider the water-supply of the poor. Crowded together as they are, with numerous neglected outhouses for the accommodation of so many and in such close proximity to their wells, which are often filled with surface water saturated with the drainings from cesspools, stables, pig pens and kitchen slops, we find here the most formidable enemy to the health of the poor. Whilst the rich have, or may have at least, their buildings a proper distance from their wells, the poor are so hemmed in by their own and their neighbors' buildings that their wells, if dug wells, must of necessity be death traps.

Having thus briefly pointed out the dangers that menace the health of the poor, it now remains to indicate the diseases that naturally lie along the line of these dangers. Insufficient nourishment impoverishes the blood and produces anæmia and general debility. Inhalation of an atmosphere containing too much carbonic acid gas and too little oxygen, predisposes to venous congestions and nervous derangements. To the general debility produced by insufficient nourishment and the continuous inhalation of a poisoned atmosphere, add the scanty clothing with which the poor are able to provide themselves, and it is no wonder that during the winter season so many of them are subject to coughs, colds, acute bronchitis and pneumonia.

The drinking water of the poor, teeming with deadly microbes (as Prof. Fall last evening pointed out) carries the germs of disease in countless thousands into the stomach, through the alimentary tract and even into the solid tissues of the body, thus intensifying and rendering more malignant among the poor all those diseases due to the presence of bacteria in the human system. Among these bacterial diseases we might mention cholera infantum, cholera morbus and dysentery which furnish a frightful rate of mortality among the poor. These several agencies mentioned, with their separate and combined influence, reduce to the minimum the power of resistance to the encroachment of any disease. They paralyze human energy; they antagonize cell development and molecular activity, thus favoring the accumulation within the system of the products of decay and worn out tissues and destroying the harmonious relation that should exist in the human economy between waste and supply. Also in this accumulation of the products of decay we find a favorable nidus for the growth and development of bacteria, and as this accumulation is quite largely deposited in or near the perspiratory glands, hence obstinate cases of skin diseases result from bacterial origin. I have intentionally omitted the introduction of mortuary statistics, which

though interesting to the student are tiresome to an audience, choosing rather to direct attention to those diseases common among the poor, which destroy more than one-tenth of all the children born, before they are two years old, and another one-tenth before they are ten years old.

Whilst I do not claim that the rich are exempt from these diseases, I maintain that the rate of mortality among them is much smaller than among the poor, and the remedy for the removal of these dangers lies within the powers delegated to municipal authorities and boards of health. If individuals fail to fully realize the dangers to which they expose themselves and their neighbors by their lack of thorough sanitation, then let municipal authorities and boards of health decide what things are nuisances and prejudicial to the health and welfare of the community and have such nuisances abated.

DISCUSSION OF DISEASES INCIDENT TO POVERTY.

BY A. ARNOLD CLARK, OF LANSING, MICH.

Hawthorne once regretted that we should divide men into classes and refer to them as "those who have money and those who have not." He said we might as well classify men as those who have gout and those who have not, because the gout is sort of a bond of union among the rich. When we are told that a man has the dyspepsia we don't need to be told that he is a high liver. So perhaps neuralgia might be looked upon as a fashionable disease. Dr. Johnson said it was the peculiar privilege of the poor man to be healthy without the aid of drugs. But, like all other attempts to prove poverty a good thing. this failed. The poor man can be healthy without the use of drugs, but he may have to get along without drugs when he is sick.

Disease is a greater enemy of the poor man than of the rich man. This is proved by the fact that the mortality among printers, glass-workers, and men working in other trades, is two or three times as heavy as among lawyers, ministers, and doctors, though the mortality among doctors is said to be higher than among other professional men because of the great exposure to communicable diseases.

Every trade has some disease which serves as sort of a coat of arms for that trade. We hear of "painters colic," "potters asthma," "grinders asthma," and "coal miners black lung." We even hear of "knife grinders consumption" among those who have to breathe an atmosphere of fine steel dust for twelve to fourteen hours a day. Printers are subject to lead poisoning. Hatters have to stand all day in a room with very high temperature and water up to the ankles. It is even said that the hair of coppersmiths sometimes turns green because of the absorption of the copper acetate. But it is not my purpose to speak of the diseases incident to trades. Some might say they were not diseases incident to poverty. Suffice it to say, every city should have a sanitary inspector of factories, who should see to it that every factory has the best appliances for removing poisonous gases, the best safety apparatus,—masks and respirators for protecting the eyes and lungs of workmen, and a public bath for employés. In occupations particularly dangerous to life and health, the hours of labor should be very much

reduced by law. If I maintain a slaughter house which is offensive to the nostrils of a thickly populated community, I maintain a nuisance, but what shall we call the factory which daily endangers the life and health of its employés?

What are the diseases incident to poverty, independent of those diseases incident to trades? They are not so noticeable in Michigan as in the large cities. We must remember in this connection what has been called "Farr's Law of Density,"—"the nearer men live to each other the shorter their lives are." We must also remember that at present 25 per cent of the population of the United States live in the large cities. Less than a century ago it was only 3 per cent. We are rapidly approaching the condition of European society where the city has swallowed up the State. "A thousand perils" cried the Roman poet, "a thousand perils beset the great city," and he was right. It is in the great city that we meet the extremes of poverty, the great mortality and contamination of the soil. Rome fell when she had absorbed the population of Italy and become the center of corruption as well as the center of military glory. Paris has become France, and at Parisian caprice must France be governed. How long before it shall be said that New York is America? Our population is already congested, we are not only crowded into the large cities, but here we are crowded into a few houses. The people of New York city live, on the average, twenty persons to a dwelling. Less than four per cent of the people of New York live in single houses, and they are the rich few. They get the sunshine, they get the best water-supply and sewerage which the city affords. But the tenement house is the poor man's home, if you can call that home where the father never by daylight sees the faces of his children.

Bishop Huntington, a few weeks ago, investigated some of the tenement houses of New York. He found 2,076 people living on one block. Think of crowding the population of Albion into less than two blocks. He found these people living sometimes fourteen or fifteen in two rooms or even in one room. This small room served as laundry, workshop, parlor, kitchen and bedroom. "The nearer people live to each other the shorter their lives are." Is it any wonder that two-thirds of the mortality of New York city should occur in the tenements? Is it any wonder that the mortality in the city is two or three times as high as in the country? Is it any wonder that these people waste away by the thousands with what is known as "tenement house rot?" A gentleman who witnessed the riot of 1868, wrote soon after of these tall, dirty buildings, as literally "hives of sickness and vice." The tenants had gathered on the sidewalk to see the fire. Mr. Willis describes the wretchedness, the disease, the drunkenness, the sin and squalor, and says that to walk the streets as he walked them "during those hours of conflagration and riot was like a fearful witnessing of the day of judgment, with every wicked thing revealed, every hidden horror and abomination laid bare before hell's expectant gaze."

People would get excited over a conflagation in one of these tenement blocks, they would watch the flames leaping from room to room, they would see the faces at the window and exclaim, dreadful! dreadful! no matter what the cost, bring on the fire department. But once strike a diphtheria spark in one of these houses and it is just as sure to spread over the entire building as blaze,—and more, because isolation of the sick is impossible,

people are used to it, and the sanitary department is not as well paid or organized as the fire department.

Bishop Huntington says that a death in one of these houses is only looked upon as "a disagreeable accident." "The corpse lies for two days in the same room where the family eats and works and sleeps." Perhaps another child is sick in the room and the temperature above the bed registers over 100 degrees. In the rules which Dr. Vaughan gives for the prevention of the formation of tyrotoxicon in milk, I read that when the milk is received by the consumer it should be kept in a clean place free from dust at a temperature not over 60°, but here it is over 100°, and they can't afford ice. They not only get an impure quality of food, but their nostrils are constantly greeted by poisonous gases from the sewer; or perhaps the slops are run by imperfect drainage into the cesspool in the back yard, and they pour water into the cesspool and take it out of the well.

So when you ask me to tell the diseases incident to poverty I mention scarlet fever, diphtheria and all those diseases which depend for their restriction on the isolation of the patient, I mention all diseases which are aggravated by impure air, over-crowding, and soil contamination. I mention wasting diseases, and nervous diseases, diseases due to exposure, rheumatism in damp cellars, pneumonia and bronchitis in winter, and cholera infantum in summer, in fact all those diseases which we often lay to "God's providence," but which are really due to "man's improvidence." I don't say that "every sick man is a rascal," but there would be no sickness from preventable diseases if there was not some rascality somewhere.

What is true of the large cities is true in degree in the small cities. Dr. Russell, the health officer of Glasgow, from a study of the different cities of Scotland, came to the conclusion that in those cities, where there was the highest average number of persons to the room, there was the highest mortality. He also found from a study of the twenty-four statistical districts of Glasgow, that in those districts where there were the most large houses, and the fewest small houses, there was the lowest mortality, and vice versa.

The reports of the Registrar General of Great Britain indicate that for every 1,000 persons living in England and Wales, twenty-five die in the cities where only seventeen die in the country. You see why Coleridge said, "God made the country, but man made the town."

In Rhode Island the experience of fifteen years shows that the chances are a man will live five or six years longer in the country than in the city of Providence. Some of this may be due to the greater worry and hurry and fret of city life, but much of it is due to poverty.

Frequently, reports received at the office of the Michigan State Board of Health read, "family lived in a log house, isolation was impossible" or "low, damp soil," or "family well-to-do and the case was kept isolated from the other members of the family,—no other cases occurred." In one case there were, I believe, five deaths in one family from diphtheria, and the health officer wrote that the family was poor, lived in a log house with only three rooms, and that it was absolutely impossible to isolate the sick from the well.

It is only a question of degree. We don't see so much of this problem in Michigan because we have not here such extremes of poverty. But after all, what is poverty? It is the lack of something essential to the enjoyment of health and happiness. And what is more essential than air? An English

writer says that men could live three weeks without food, three days without water, but only three minutes without air. Now, whether a man lives in the tenement houses of New York, the factories of Michigan, or the recitation rooms of our schools and colleges, if he has to breathe air which has been breathed before, he is a poor man and must expect to "enjoy poor health." Why did over 120 Englishmen die within a few hours in the famous black hole of Calcutta? Because they had breathed up all the air there was there in about fifteen minutes. They then had to commence breathing each other's breaths and they kept on breathing each other's breaths until they finally died for want of breath. Shut up fifty scholars in the ordinary recitation room, and they will breathe all the air up in a few minutes, and if there is not proper ventilation they will then commence to breathe their own breaths over again,—not their own breaths, for each pupil "hasn't the privilege of choosing his own breath, but must take it as it comes." Now those students may have a good deal of money, but they have some of the main symptoms of poverty; and I don't think my definition a narrow one when I say that the main symptoms of poverty are unsanitary surroundings. I don't say that all poor people have unsanitary surroundings, but the two go hand in hand; and if science is ever to lift men out of poverty a large share of the work must be done by sanitary science.

A year ago the U. S. Commissioner of Labor sent inquiries to prominent people all over the country, asking the cause of the late labor depression. He received 119 different replies, and one man said that all labor depressions and poverty were due simply to a neglect of the principles of sanitary science. I would not be so narrow as that, but I would say that unsanitary surroundings take away self respect, make men peevish, give them impure blood, dull their brains, and do, I believe, tend directly to lower their wages. I believe that if you could give men better food, better air, better water, in short raise their standard of living, you would raise the standard of wages. I believe that if you could reduce the American laborers to the Hindu standard of living they would soon fall to the Hindu standard of wages. I believe that one way to make a slave of the American laborer is to keep him sick three-quarters of his time.

Perhaps it is of more interest for us to know that not only is there a great deal of sickness incident to poverty, but there is a great deal of poverty incident to sickness. Poverty makes a good many sick, but sickness makes a a good many poor. The fowl is hatched by the egg, but the fowl lays the egg. Max von Pettenkofer says that every citizen of Germany is sick on the average twenty days out of each year. This is based on reliable data. If every citizen of Michigan is sick twenty days out of each year that means forty million days lost in Michigan each year because of sickness. If the cost of drugs and medical attendance be placed at the low figure of fifty cents per day, and the loss of wages at the same low figure, (in all $1.00 per day,) then the people of Michigan are forty million dollars poorer each year because of sickness. Who pays the doctors of Michigan? Who maintains the drug stores? Who loses wages when he is sick? The poor man. We hate to see a poor man burned out of house and home. We put in hose carts, hook and ladder truck, electric bells, and have horses ready to run at a moment's notice to save our houses from fire. The city of Detroit spends each year $200,000 to maintain its fire department. Yet I do not believe the annual money loss from fires in Michigan is as great as the annual money

loss from sickness and deaths. How much more reason then for having a well-paid sanitary fire department in every city in Michigan as active on the outbreak of a communicable disease as a fire department would be on the outbreak of a fire.

To put what I have said in a nutshell, I believe that what the fowl is to the egg and the egg is to the fowl, that disease and poverty are to each other. They are of the same species. Each multiplies and produces the other "after its own kind."

Dr. Henry F. Lyster, member of the State Board of Health, of Detroit, being called upon, spoke of the sickness due to living on a low, damp soil and said that the idea that poor children, who had to go with bare feet, grew up to be more hardy than others was false. The best clothed children are the healthiest.

Fourth Session—December 7, at 2:30 P. M.

DISPOSAL OF WASTE IN ALBION, BY SEWERAGE AND OTHERWISE.

BY J. C. ESLOW, OF ALBION.

When I was informed that a committee of citizens had named me to prepare a paper to be read before this Convention, I regarded it as a huge joke, and considered it so until I received notice of their action from Dr. Henry B. Baker, Secretary of State Board of Health. My time for research and preparation having been very limited, and for other reasons, this Convention must not expect much from me on the subject assigned: "Disposal of waste in Albion, by sewerage and otherwise."

Quite lately, when in conversation about the electric lighting of our city and the adoption of water-works, the question was asked, "Are you in favor of it?" I replied, "Yes, by all means." For if I have ever made any money it has been by improving my property, by the improvement of other property and in keeping our little city fully abreast if not in advance of other places in our State and nation. To succeed in a financial way we must do this. Good liberal levies of taxes, judiciously expended, are a necessity to the growth of a city. The business man can afford to and will pay good rental if the real estate owner will make his property and city so inviting as to call the transient and permanent customers to him, and the owner of real estate can afford to pay good taxes if he can get a liberal rental, as he makes money by so doing. To illustrate: when in conversation with a business man (only twelve miles from here), last week, I was asked, what such a store as he occupied would rent for in Albion, I replied that as well located in Albion as it was there, it would bring from five to six hundred dollars per annum. He informed me that he paid $18.00 per month, or $216.00 per year. As good a store and as well located in our beautiful city would readily rent for $500.00, leaving $284.00 to pay the extra taxes, insurance, etc. So much for enterprise. Our live manufactories, live business men, live college president

and faculty—long may they live. I am in favor of a thorough sewer system, and to have this we must have an ample water-supply, and both are very necessary to the health of any community. The better the water and sewerage, the lower the death rate. This is clearly proved by the statistics of sewered and unsewered cities. The city of Brooklyn, N. Y., which has as nearly a perfect sewerage and water-supply system as any city, in the years 1880 to 1884 inclusive, had 1½ deaths from typhoid fever to 10,000 inhabitants. In the same time Marseilles, France, had 12.8 deaths from typhoid fever to 10,000 living. The mean annual death-rate of Chicago, according to Dr. Rauch's investigations, for 14 years (1843 to 1856) prior to sewerage, was 37.91, and for 14 years (1857 to 1870) following the introduction of sewerage, it was 23.97; for the 14 years, 1871 to 1884, with more complete sewerage and water-supply, it was 21.4. Compare this with the death-rate of the city of Mexico, an unsewered city, whose annual death-rate for two years (1877–1878) was 52 to every 1,000 living, and unsewered Pekin, China, with a death-rate of 50 to every 1,000; and yet the question is asked by some, can we afford to be to the expense? I answer, yes.

From childhood until I was thirty-five years old I was healthy and strong. I had no time to consider the necessity of sewerage, water-supply or any subject connected with the continuance of health, my time being taken up with business cares; but later on nature called a halt, and I found I could not do as I had done in the past. I knew not what to do, because I had never given a moment's thought how to care for myself to continue health and happiness. I mention this to illustrate that a person in poor health is poor though he may have means at his disposal, while a poor man is rich in the enjoyment of health, with limited means, if he only knows its value. The use of bad water and the absence of sewerage causes a large proportion of sickness, as has been shown. Who ever saw a healthy business man in the poorhouse? Why not? As a rule he has of the necessities of life that which is wholesome and pure, while the poor have the poorest, from childhood to manhood. Their earlier days are spent where the supplies are in keeping with poverty,—poor food and poor water. More than probable the landlord allows the privy vault to be overrun and deposit its contents in the well or cistern near by, feeling, no doubt, that it is all he can afford to do for the amount of rent he receives from the family, who are paying the entire earnings of the husband and overworked wife to satisfy in part the doctor, who, through kindness, visits the sick daughter, who is sick of typhoid fever, caused from drinking the filthy water from the neglected well. The doctor never expects to get more than 50 per cent. of his bill, and the druggist even less for his medicines. The time and money used in preventable cases of sickness applied to the construction of public water-works and sewerage would soon make them complete and protect health as nothing else will. Let us apply the annual rate of mortality of Michigan to our own city, and the rate includes the sewered cities, viz.: between 5 and 6 deaths for 10,000 living, in the State, giving us about 2 deaths each year, the expenses of which, we will say, will be an average of 30 days' sickness, at $1.00 per day, $30.00; medical attendance and nurses, $50.00; funeral expenses $50.00; total, $130.00. The best information I can get leads me to think that there are twelve to fifteen recoveries to every death. At the same average, omitting the $50.00 for funeral expenses, we would have for these cases a loss of $960.00, or in all a total of $1,220.00. I find, by reference to the burial records, that in the last 12

months we have had 21 burials, of which three were caused by typhoid fever, within our city limits; this would be an average of 7 to 10,000 living,—more than the average of our State. With good sewerage and water-supply no doubt the average could be reduced below the State average. The suffering of course cannot be estimated in money. Much of this expense could be saved had we the complete sanitary system we should have.

The first portion of the new sewerage system of London, Eng., was begun in January, 1859; the system was formally opened in April, 1865. The fever mortality has fallen off in London since 1865 four-fifths of what it was in 1860, showing the effect of good sewerage on fevers of all kinds. The above calculation was made upon a typhoid fever basis only, and in my opinion 5,000 would be saved annually to our inhabitants by a system of water-supply and sewers. This amount each year would soon pay the entire investment, and we could not leave a better inheritance to our children than a good guarantee of health and long life, and they could thereby accumulate for themselves the good things of this world. We find that in the city of Berlin sickness from fever in non-sewered houses was 1 case to 9.3 houses, in sewered houses 1 case to 49.3 houses; deaths from fever in the non-sewered districts 1 to each 43, and in sewered houses 1 death to 137.5 houses. The time at my disposal will not allow me to give this subject the investigation I should desire. I find it a very fruitful subject, and the more thought given it, the greater the interest and desire to investigate further.

I find there are in use two systems of sewerage. They are called the pneumatic and the water-carriage systems. The first need not be considered here, as it is very expensive and used only when necessity compels. The water-carriage system is for general use (for surface draining and excreta combined), or what is known as the separate system,—which consists of two separate lines of pipe, one to carry off the rainfall, and the other, the excreta, water from roofs, and water supplied to houses and yards from water-works. The subject of surface-draining needs a great deal of thought which a competent engineer will be qualified to give, and it is a matter of importance in sewering a city.

I would recommend the water-carriage system with two sets of pipe, and especially would I recommend glazed sewer pipe. The two pipes of suitable size would cost but little if any more than one large enough to do the entire work, and each working separately would do the work much better than a large pipe in low service. Experiments have been tried in large, broad sewers, where the deposits would move very slowly, by placing a smaller pipe inside of the sewer, and the force would clean the pipe and it would do the work perfectly. This was plainly illustrated at the mouth of the Mississippi river where, so long as it covered a large amount of surface, the water moved slowly out of its six mouths, but, with the aid of a narrow channel, it rapidly cut its way through the bars and secures to us navigation which many feared would be destroyed. It costs no more to make the excavation for two pipes than one, and much damage has been done in cities by the stoppage of sewers and their overflow from extra storm water, causing the overflow of the filthy contents of the combined system of sewerage, to be deposited in cellars, and at times upon the surface. Memphis, Tenn., has the double system, and it is highly recommended.

The following are among the reasons why I would recommend sewer pipe: There is no damage of leakage if properly laid, while no one can make a

brick sewer and guard against filtration, and quite often there are imperfect joints allowing leakage; a good and perfect sewer can be made in quicksand with pipe, where it would be quite impossible with one of brick; the inlet into the pipe is safe and durable, no sewer gas leaking from the pipe; traps can be safely put in and angles turned; it has a comparatively smooth surface, taking much less water to remove the same deposit than in a brick sewer; it costs less, lasts longer, and needs less attention; it can be had in all sizes and in sections; it can be laid by a novice, while brick must be laid by an expert. Any one who can shovel dirt and mix mortar and tell when water runs down hill, can lay his own laterals of pipe.

The good Lord has made the conditions very good for us, for both a bountiful and pure water-supply. As to drainage, we have two natural outlets, one by the Kalamazoo river, from the east through our entire city, which will drain all north of Erie street; and east of the West Branch and the marsh, which has been partially reclaimed by the Eslow-Irwin ditch, all south of Erie street may be drained by sewers laid in the marsh. This marsh may be reclaimed entire by laying laterals of tile to take the drainage of the marsh, and I would think it right and just for our city council to consider this improvement immediately, and cause such a sewer to be constructed as the future wants of our city would demand, paying that proportion of the expense by which the public would be benefited, in the way of health and drainage, out of the public moneys, and assess the balance, as per benefits, upon the property. This would remove a blemish from our otherwise beautiful city. Our city has few marshes except those adjoining rivers, which are easily drained. What few swamp holes and marshes we had, our enterprising townsman, Hon. W. H. Brockway, has filled up, and at times it seems that he, like the warrior of old, would sit down and cry, not because there were no more worlds to conquer, but because there were no more marshes to fill. By the natural lay of the land it is an easy work to make a perfect sewer system in and for our city. A 12-inch pipe, laid 3 feet fall to 100 feet, will discharge 2,350 gallons of water per minute, or 73½ barrels. The same size laid 1½ inches fall to 100 feet will discharge 470 gallons. De Letheby considers that 1,000 persons of a city population contribute 3,750 gallons of sewage per day. The sewer laid last year by the city has 18 feet fall in 900 feet, or 2 feet to 100 feet. The capacity of a 12-inch sewer, under this fall, is 1,920 gallons per minute. Estimating our population at 4,500, which would include transients and students, who must be provided for in our sewerage system, and applying De Letheby's proportions we find that they furnish 703 gallons of sewage per hour; adding to this two parts of water, we have 2,109 gallons per hour. Could a twelve-inch pipe have 3 feet fall to 100 feet, its capacity would be 2,350 gallons per hour, or 241 gallons more than necessary for a population of 4,500 people. The capacity of the 18-inch drain, having two feet fall to 100 feet, laid by the city last year, is 5,270 gallons per hour, or 2½ times the demands of our entire city, could it be utilized; but it is a good fault, for it is better to err in having extra capacity than too little.

I regret very much that that I have not had the time to give comparative tables of facts connected with this subject, and in more fully explaining the different systems of sewerage used. I wish to call your attention to the fact that our country people, and I may say townsmen, in visiting Paris, refer to the cleanly condition of its sewers, and they give the general impression that

something wonderful is accomplished in the way of sanitary work there. Said a townsman of ours to me: "I went into the sewers of Paris, and they were as clean as the paved streets of our cities,—yes, cleaner." Men are constantly engaged cleaning them. and live with their families in rooms adjacent thereto. The general impression is that the cleanly condition is owing to hygienic laws, strictly enforced, which is true, but these laws forbade the emptying of excreta into the sewers, until quite lately, and it is now allowed only to a small extent. In 1882 Paris had no less than 80,000 cess-pits, 30,000 shallow wells, and the work of cleaning was done by scavengers. This explains why her sewers are so cleanly. It is much better to convey away from our homes these deposits of filth, deposit them in our sewers, and preserve cleanly surroundings on the surface, than to have a New Orleans with its surface unsewered. They are surrounded by water, and protected from its overflow by levees, without the possibility of an underground sewerage in their present condition. Their streets are washed in early morning with dirty Mississippi water, and the washings are conveyed on in unsightly open ditches. To me it is one of the great blemishes of the city. There a poor man is buried in the ground, while, if he has means to pay for a receptacle, his body is placed in a vault. I was told that the water was so near the surface, that burials could not be made without forcing the coffin into the water. I know their places for the dead are generally unsightly.

Chicago had a man who had the courage to offer a resolution to raise the city of Chicago above sewerage. He was called crazy when he did so, but that man, Samuel Myers, then sixty years of age, lived to see his resolution adopted, the work, comparatively speaking, complete, and the death-rate largely reduced on account of it. Memphis, Tenn., learned the lesson from sad experience, and now has the double system of sewerage, and its cleanliness is noticeable. Shall we wait until we have an experience of this kind, to induce us to protect ourselves from disease? I hope not. From my own experience I can say: "Give me health and I will be happy without wealth."

I would in conclusion recommend a thorough sewerage system laid under the supervision of a competent committee, appointed and employed by the city council. The mains should be laid two blocks apart, running to the river, or to an outlet sewer laid in the marsh south, and all laterals should be laid under the supervision of some competent person. No house should be connected with the sewer in any main without being trapped, and I would favor requiring a certificate that the house was properly sewered to make it rentable. Man-holes, ventilators and catch basins are necessary to the workings and healthy conditions of our sewers. Suitable arrangements should be made for flushing. This can be done automatically. We should have our water-supply with our sewerage for many reasons. The sewers are comparatively useless without it. It makes two jobs of digging up our streets, to have them one at a time, which we cannot afford. We can afford to be ahead of our neighbors, and cannot afford to be followers. We have got the push and enterprise, and Marshall has the money, and I fear the grass will grow in her streets unless we or some other community keep it down by going there to borrow their money. They have one healthy industry there I hear, just started,—a casket factory,—and we want to stop the demand for their goods here. We want the city to own and operate water-works with boiler capacity enough to run the engine or engines for our

electric lighting. We want good sewerage, then we will have good water, good light, good health; and I hope the deliberations of this convention will hurry them forward that we may have them constructed in 1888.

DISCUSSION OF SEWERAGE.

BY HENRY F. LYSTER, M. D., MEMBER OF THE STATE BOARD OF HEALTH, OF DETROIT.

The millennium of sanitary science is in the distance. In a new country it is easier to get along, but as Albion grows you will find it harder and harder. First, I would advise you to make a sanitary survey. This embraces topography of ground, strata of rocks and character of buildings, and also the size of your houses, systems of ventilation, water-supply, and method of disposing of waste. These same subjects apply to the farm as well as to the village, but they constantly grow more important as the town grows. I would advise you to divide your city up into districts, get some doctor or other promoter of public health to take blanks, and have a house to house sanitary inspection made. By this means a good deal of information can be obtained. Then comes the question how to manage in conformity with this survey. First, where shall the water-supply be obtained? Sewerage presupposes a water-supply to flush the sewers. A paper by Erwin F. Smith which has been distributed at the sessions of this convention, shows that the mortality in prominent cities has been greatly diminished where systems of sewerage and water-supply have been adopted. Among Anglo Saxons during the past ten years there seems to be a wonderful diminution in the death-rate as a result of sanitary work. This is not noticeable in the Latin cities. The statistics are so complete that even the most sceptical must be convinced.

In Albion it can hardly be expected that a general system of sewerage will be introduced, but it might be introduced in the most thickly inhabited portions. The dry-earth system and disinfection should be urged in preference to the traditional cesspool and vault. Stable yards and cesspools are a source of danger. It is sometimes said that the ammonia developed in the barnyard is a disinfectant, but the fact is—manure heaps are as poisonous as any other effete matter. The introduction of water-supply and sewerage will do away with the preventable diseases. Typhoid fever comes from bad water in the fall of the year when the water-supply is low, and it is much more prevalent in the old towns than in towns where they have a good system of sewerage and water-supply. Detroit has the old system of sewers and much disease. It would be better if we had the double system. In Albion there is a natural slant, so that the storm water could be easily carried off, and you should have Col. Waring's system of small sewers, like that introduced in Memphis. It would not cost much, and it would diminish such diseases as dysentery and typhoid fever. Typhoid fever is by no means confined to the large cities but it occurs in the country. In these conventions it is best to talk about practical things, and I am in hopes that practical good will result to the city of Albion from this convention in the direction of a system of sewerage and water-supply.

SCHOOL HYGIENE.

BY HETTIE WARNER BRADLEY, OF ALBION.

The character of the citizens of the future will be determined, to a great extent, by the character and success of the schools of to-day. The success of the schools depends upon the *physical* as well as the mental and moral training of the pupils. The belief is quite general that the children of American families are physically declining, and "too much education" is frequently given as the principal reason for this degeneracy. This subject is one of vital importance, and should be discussed by school officers, that they may properly construct and arrange school buildings; by tax-payers, that they may realize full value for money expended for school purposes; by teachers, that they may care for the health of pupils; by physicians, that they may enlighten others less favored with opportunities for scientific research; by fathers, that they may make all necessary provisions; and by mothers, that they may perform their sacred duties acceptably. It is from a mother's standpoint that I look at this subject, and though, not expecting to instruct the members of this convention, I do hope to receive enlightenment from others.

VENTILATION.

The selection of good sites for school buildings, and arrangements for properly ventilating, heating and lighting them, are prominent features of this subject. The external beauty of the structures should be of small moment compared to these. One pleases the eye, the other affects the whole system. The subject of ventilation may receive all due attention in city schools, superintended, as they are, by educated men, and controlled by intelligent boards; but the school-houses in rural districts are many of them very deficient in this particular. It is impossible for children to continue in perfect good health, any great length of time, when they are compelled to endure several hours' confinement daily, in a room of unwholesome conditions. The air in our school rooms (and homes also) should be able to stand the severest tests modern science can bring to bear upon them. The water should be above suspicion. The grounds and out-buildings ought to bear constant testimony to the doctrine that "Cleanliness is next to Godliness."

HIGH BUILDINGS.

The signs of the times seem to indicate a reform in the old custom of erecting school buildings many stories high, and then holding the more advanced classes in the higher rooms. The long train of ills, following this practice, is known only too well to the victims, mothers and physicians. Welcome the reform, and may it reach every village in our State! The suggestion has been made by patrons that, in our smaller towns, ward school-houses be extended so that more grades may receive instruction there. This, of course, would exempt many of the younger children from the long, tedious walks, necessitated by attending central schools.

RECESS OR NO RECESS.

I hesitate to criticise anything that receives the hearty support of some of the best teachers throughout our State, but the plea that comes from the

mothers induces me to mention the subject. Mothers claim that individual recesses are extremely distasteful to timid children, and that they fail to avail themselves of the opportunities offered, that they often return from the school room (after confinement during an entire session) with throbbing temples and feverish brow,—Nature's protest against the system. Some people think that we should go back to the old fashioned plan of short, separate recesses. Others think that all should have a recess of at least ten minutes' duration, where boys, and girls and teachers may all go out of doors together and inhale the pure air of heaven, while windows and doors are thrown open in their absence. One writer says: "They would return from such a recess with blood made fresh and red, eyes and nerves rested, hunger appeased by a light lunch if desired, and nature's wants relieved; all would return to rooms cleansed of their foul exhalations by the flood of air pouring through them."

TEACHERS.

"The school teachers of to-day are the guardians of America's safety." And yet many of these teachers are young people, who have been rushed through a course of study, and received the regulation diploma and certificate. They are often lacking in the maturity of mind and judgment, necessary for the duties they assume,—training children for future citizenship. Sometimes teachers are employed whose bodies are diseased and brains "muddled" by the use of narcotics. If it is our duty to examine the air in the school rooms, it is a far *more imperative* duty that we understand the nature of the *moral atmosphere* of our teachers. Michigan now wisely decrees that every teacher shall know something about the science of health, and be prepared to teach the same. It is our privilege, as parents and patrons, to insist upon their making practical use of this knowledge. The better they understand sanitary science, and the more thoroughly they teach it, the better it is for the children. In order that we may *know* something about *how well* these matters are attended to in our schools, we would advise frequent visits to the school rooms. The mind cannot reach any great degree of successful development within a body composed of distorted bones, diseased nerves, compressed lungs, and bad blood.

FOOD AND DRESS.

Food and dress are important factors in the health of school children and belong to the mother's kingdom. Teachers may suggest, physicians advise, fathers protest, but the mothers usually control. A wide field for reformation is here open for the labors of intelligent, christian women. The requirements of health should never give place to the demands of fashion. The chest should have a good chance to expand, and the blood an opportunity to circulate as freely through the veins of our girls as of our boys. In winter we should procure for them mittens and overshoes, warm cloaks and hoods, thick shoes with low heels, and their forms should be enveloped with flannel. Rich and poor people alike should give their growing children substantial, unadulterated food, with few, if any, dainties; supply them with milk, if possible, bread (graham is best), and ripe fruits in their season.

"Early to bed and early to rise" is as good a sentiment to teach the

children of to-day as it was fifty years ago. We ought never to allow them to be long idle or unoccupied, and should expect them to perform tasks requiring manual labor. Let us teach the little ones the value of pure thoughts, and the danger of evil ones which, fostered, lead to pernicious, ruinous habits. We cannot hope that our children will not come in contact with evil, especially, as in daily passing to and from school, they meet with evil in one of its worst forms,—intemperance,—and alluring rooms are placed all along our public thoroughfares. That they may meet evil bravely and rise above it grandly is what we work and pray for.

After sowing all this good seed, and doing all of these very sensible things, may we not trust that their development will result in healthy, vigorous bodies, wherein the brains may live and grow. I know of nothing better to give our children than the glorious combination of industrious habits, healthy bodies, strong minds, and good morals.

DISCIPLINE.

Many of our schools are models of excellence in regard to discipline, and it would be idle to contend that discipline is unnecessary. The accumulation of useful, practical knowledge should be the aim of all school efforts, and this ultimate result ought never to be sacrificed for mere forms and ceremonies. Any discipline that might prove injurious to the health of pupils, is questionable. We would be sustained in censuring a teacher who would compel children to form out of doors, with wraps removed, for the purpose of entering the schoolroom in good order, unless the weather was perfectly warm and pleasant. Neither would it be unreasonable in cold weather to expect the teacher to superintend the matter of adjusting wraps for the very small children, before they leave the school-house. You may say this is not the teacher's business, but it must be done, if they endure the long walks, especially in the country, without suffering. If the teacher does not make it her business, who will?

OVERWORK.

The extensive course of study and consequent amount of mental work is often held responsible for all the ills that befall the children. This is as unjust as the cramming system is dangerous. If the brain, while in process of development, be overcrowded, there will be a corresponding weakening of the whole system. But our children can stand a goodly amount of hard study and deep thought if the laws of health are strictly observed in all details. Our country needs vigorous thinkers, but she will never find them among the children whose brains have been crowded with facts at the expense of the body. The gay colored bird gives a lively effect to the jaunty hat on the head of a pretty girl, if we can banish the thought that for her adornment the little songster's heart was forever stilled, its musical voice forever hushed. Likewise a young Miss, bearing a diploma as the insignia of her successful pursuance of a course of study, is an interesting sight, if her eye is bright, her step elastic and complexion fresh, but if the honors have been secured at the sacrifice of health the spectacle is deplorable. Do not attribute failures in health to hard study alone. Remember the walks in the moonlight, the improper clothing and food, the hanging on gates and lingering on piazzas, and then say whether the parents are not as responsible as the teachers. Many object to the

competitive system as applied to our youths, and think it has produced a ruinous effect upon their mental as well as physical constitution. Allusion is seldom made to one great danger of this system. Scholars, in their desire to maintain class standing, are often compelled to work beyond their strength, and slight illness often results. Instead of removing the mental strain, and using a few hygienic precautions, physicians are sometimes summoned, who prescribe stimulating medicines and quieting powders. You all know the result of the continuance of such a course,—confirmed habits of daily doses of the dangerous drugs, until the body is wrecked and soul destroyed; and the victims are not the ones to be blamed. How carefully should the mother guard her children! How conscientiously should the physician who understands the danger, protect these young people who do not. It would be better economy to pension the small army of physicians sent out from the medical colleges yearly, than to support them by paying for professional services for our children, whose health may be *preserved* by giving attention to hygienic rules.

PHYSIOLOGY AND HYGIENE.

The legislature of our State has shown a deep interest in the citizens of the future, by making a law that "Instruction shall be given in physiology and hygiene, with special reference to the nature of alcohol and narcotics, and their effect upon the human system" in every department of every school, where public money is used in its support. "The district board shall require each teacher in the public schools, before placing the school register in the hands of the director, to certify therein whether or not, instruction has been given in the school or grade presided over by such teacher." "And the director shall file with the township clerk a certified copy of such certificate." Any school board neglecting or refusing to comply with these provisions shall be subject to fine or forfeiture.

Any teacher of observation will sustain me in the assertion that boys who commence to use alcohol and tobacco will neglect their lessons and soon lose their ambition. Some men—habitual users of these poisons—have risen to eminent positions in life, but their success may not be a tithe of what it might have been had they been wise enough to have entirely relinguished the use of them.

It is a matter of surprise to teachers to find how readily pupils will learn and comprehend this study when it is properly explained. The wonderful network of telegraph lines called nerves which traverse the whole system, the miraculous organ which at every throb sends the life giving blood into the most minute parts of the body, the great busy brain at work within the cranium, the intricate machinery of the digestive apparatus, the manner in which air penetrates the cells of the lungs, and then the deadly effects of alcohol and tobacco on all of these living tissues, are as well understood by children from five to ten years of age, as by men and women of middle life. A superintendent of schools in Massachusetts says: "This study ought to be taught. If the list of studies is already great, take something else out and make room for this, for it is entitled to the right of way."

Frances Willard says: "The life of a drinker of alcoholics has but two periods; in the first of which he could leave off if he would; in the last he would leave off if he could. How shall the young and thoughtless avoid this supreme peril of their youth, unless they know about it, and how shall

they know unless they be taught, and how can instructors teach unless they have the proper authority?" Mothers have come to me during the past weeks, with tearful eyes and anxious hearts, asking advice in regard to the enforcement of this law requiring the teaching of hygiene in their schools. This is the only answer I could give them,—Let us study the book of Michigan school laws, thoroughly understand the provisions and our rights respecting them, and then demand their enforcement.

We can more easily afford to offend our neighbors *now*, than to run the risk of hearing from our children, sometime in the future, this complaint: "Father, mother, why did you not teach me all these things concerning my own health before it was too late?"

Clergymen, physicians, lawyers, teachers, parents, in short everyone, should act as a special committee in this matter, and may coöperate with the Christian women of Michigan, who are making united, organized effort to have the science of health taught in every country as well as city school. These women are sending daily petitions to the "throne of grace" for strength and help and direction, and "I beseech you men, as the truest guardians of our noble State, as the most intelligent and helpful friend of the child in your midst, *stand* by these mothers, in their brave, and tender, and loving efforts to *save* the children."

DISCUSSION.

Prof. W. C. Hull, Albion: I am placed in an embarrassing position to discuss a paper which I was not able to hear. We are interested in our Albion schools, and if I have fault to find with them I should go to the school board. We are favored here. We have 600 pupils in daily attendance, and (with the exception of 150) but two floors to climb. The heating is by hot air, and the ventilation is cared for.

Prof. V. C. Vaughan, M. D., Ann Arbor: The public schools are doing grand work and I do not believe that the course of study is too long. But I do believe that the hygienic conditions of the school room are neglected; that children breathe bad air, and hence get the headache. Brain work in itself is not likely to hurt anyone, provided the air is pure and fresh, but who can study when he is tired or diseased? The remedy is to make every teacher give some attention to sanitary science The Board of Examiners should examine every teacher in hygiene, so that teachers would know about ventilation, etc. My observation has been that the school boards try to have everything about right. Money is not spared to get the very best. Nearly every man has his own theory about ventilation, but the school board should employ some competent man who knows how to ventilate and heat. Children are often injured at home as well as at school. Children study at home and by one defective lamp. It is said the schools ruin the scholars' eyes, but I believe that more damage is done by study at home. It is common to say that schools should not be built on hills, or more than two stories high,—that climbing is bad. I hold that if it is properly done,—if the scholar walks erect and bends only the knees in walking,—it is good exercise.

Fifth Session, December 7, at 7:30 P. M.

MONEY VALUE OF SANITARY WORK.

BY REV B. A. BROWN, M. D.

Practical things are the order of the day. Therefore in writing on the subject assigned me, it seems that matters relating to local issues, or issues easily applicable to local surroundings, will be most profitable and interesting. Great cities like New York, Philadelphia, and Chicago, though inter-

esting in their sanitary aspects, are not so attractive to us as something nearer home. In calling your attention, then, to the money value of sanitation, I shall confine myself to those conditions to be met with here. Especially let us direct our thoughts to three well-known diseases,—scarlet fever, diphtheria and typhoid fever. We are all more or less acquainted with these diseases,—some painfully so. This knowledge, perhaps, will make a dry subject the more attractive.

First, what is the money value of sanitation in restricting and preventing scarlet fever? This disease is contagious, and easily communicated. It has been conveyed many miles in so common a thing as a letter. This, therefore, is a malady where precautionary measures would be of great benefit. Let us look at it from a money point of view. As preliminary to this investigation, let me call your attention to the statistics of the State Board of Health for 1886, made up from the reports of local boards for townships, villages and cities. Among the 324 reported outbreaks of this disease for the year, 58 outbreaks were known to be treated with strict sanitary measures, that is, by isolation and disinfection. On the other hand in 45 outbreaks these precautions were not taken. Comparing the two we find that with neglect there were five times as many cases of this disease to the ou t-break as with sanitation. Perhaps we can best impress this fact by a diagram. (See fig. 1, p. 51.)

This report will give us a fair average; let us apply it. Suppose that in a certain town (and it need not be much larger than Albion) there occur twenty cases of scarlet fever per year. As a general rule sanitation will reduce these four-fifths,—that is, sixteen cases will be avoided by isolation and disinfection. Now counting the cost of a case of this disease at $25 we have a saving of $400 to the community. From the report above alluded to we see also the great disparity in the death-rate. In the outbreaks without sanitation there were five times as many deaths to the outbreak as in the outbreaks with sanitation. Supposing, again, that the town before referred to has *five* deaths a year from scarlet fever, sanitation, according to our average, would reduce these to one,—four saved. Estimating the expense of a fatal case of this disease, including funeral expenses, at $50.00, and we have a money gain of $200.00. Adding this amount to our $400.00, we have the sum of $600.00, saved by sanitation to a town large enough to average twenty cases of scarlet fever per annum.

The second disease on our list is diphtheria. We all know well how terrible is this dread scourge. The practice of burying patients, dying with this disease, at dead of night, shows with what terror this blighting affliction is regarded. What is the money value of sanitation in this disease? Consulting the reports of the Board of Health, we find the proportion about the same as in scarlet fever, that is, about five times as many cases, and about five times as many deaths to the outbreak without sanitation as with it. This diagram will give you an ocular demonstration of this fact. (See fig. 2, page 51.) Returning again to our imaginary town, having twenty cases of scarlet fever a year, and supposing it to have also twenty cases of diphtheria, we are able to add to our $600.00 in hand a like sum, making $1,200.00 in all,—an amount large enough to pay one of its many doctors $1,200.00 a year to devote of his time exclusively to the matter of public health.

Figs. 1 & 2 graphically represent the comparative results of Neglect and Sanitation in outbreaks of Diphtheria and Scarlet fever in Michigan in 1886, exhibiting the average number of cases to an outbreak when Isolation or Disinfection was Neglected, and when both were Enforced (It will be seen that in each disease there were about five times as many cases per outbreak when isolation or disinfection was neglected.)

(Fig 1)

Neglect.

16.18

Sanitation.

2.86

Scarlet fever.

(Fig 2)

Neglect

13.84

Sanitation.

2.74

Scale. 1 case to .35 inch vertically.

We come now to our third disease, typhoid fever. The main cause of this exhausting malady is drinking-water contaminated by leachings from privy vaults. The modern outhouse is a fruitful source of untold evils. Cannot some better way be found in small towns and cities to dispose of human waste than by this abomination? Human excrement is very valuable as a fertilizer. In some countries it is carefully husbanded and profitably used. The best use we can make of it, in a town like this, is to defile our wells, cisterns and streams with its death-bringing ingredients. Need this be the case? I think not. I will show you a plan by which our cisterns, wells and yards can be kept clean and sweet, and money put into our pockets as a community. I recently asked an intelligent business man, one well acquainted with practical farming, what he considered the offal of this city worth to the farming population around us. He replied, after some thought, $10,000; that is, the contents of barnyards and privy vaults, if properly saved and used, would increase the value of the crops of the farmers who employed it to the extent of ten thousand dollars. From a money point of view, to speak from no higher standpoint, it would pay this town, and all like places, to save and sell this offal. How shall this be done in the best and cleanest manner? It can be done by abolishing the present vault system and substituting the dry-earth closet. The advantages of this system are:—

1. Far less disagreeable odors, because, being often emptied, the night soil is comparatively fresh and not decomposed.
2. The soil of our yards will be uncontaminated by deadly filth, and
3. The contents of these closets are easily removed.

Let us now return to the $10,000 estimate above alluded to. If this seems too high, let us divide it by two, and even $5,000 is a neat sum. To keep within bounds, then, we will assume that the offal of this city, properly cared for and sold, is worth $5,000. Supposing this town to be supplied with earth closets, then $5,000 would pay well four men and two teams to devote their whole time to the collecting, preparing, and selling of this night soil, and leave each year in the city treasury some $1,500 in ready money. When collected, this offal could be carried to some open field, and there mixed with a certain amount of dry earth and wood ashes, and then sold by the ton or barrel to the farming community.

We thus get a glimpse at but a few of the many ways in which money may be saved to the city of Albion by sanitary work; not to mention the lives saved, and the comfort, health and joy which sanitation always brings.

PREVENTION OF COMMUNICABLE DISEASES, FROM THE STANDPOINT OF THE HEALTH OFFICER.

BY H. D. THOMASON, M. D., HEALTH OFFICER OF ALBION.

Robert Ingersoll was once asked in what particular he would have improved the world had its creation been in his hands. He replied, he "would have made health contagious." Now this, like some other theories, appears well upon its face, but practically will not work. If health were contagious, the normal state of man would be ill health, sickness and disease. Imagine what

this world would be like if it was peopled by weak, diseased and helpless men and women whose only ambition was to come in contact with and contract that abnormal thing known as health. Wise nature has decreed that man's normal state should be health, and only when her laws are interfered with and violated is he called upon to suffer and become abnormal in a state of disease. By the strict law of nature man should live all his years in robust health and vigor, and when his allotted time is spent, come to his end (for everything in nature must have an end) gradually, unconsciously, and as free from pain as at his birth. But the violations of nature's laws in this advanced and civilized age are so numerous and marked that we seldom see this consummation. In fact, we are all of us, whosoever we may be, grievous sinners against nature's well-established laws, and so accustomed are we to this violation that we forget to regard ourselves as transgressors. And yet every day of our lives, the best of us are guilty of something in the form of overworking, overfeeding, dissipating in one or another way, being uncleanly, or neglecting hygienic laws governing ourselves or our habitations, doing something contrary to nature's laws, and sooner or later we must suffer for the transgression, because the decrees of nature are so inexorable that in comparison the fixed laws of the Medes and Persians were as changeable as the idle talk of a silly child. We are so accustomed to seeing disease about us that we fail to remember that it is abnormal, that it is a thing nature does not intend, and that it is something, a large part of which can be prevented. For the vast majority of diseases some individual is responsible. You and I may not be personally responsible for inheriting a weak and sensitive constitution and vitality, but upon some one or more of our frisky progenitors, away back it may be, the responsibility can justly be laid that we are what we are.

Thus you see the subject of the "Prevention of Communicable Diseases" is a very wide and broad one, which opens up considerations in various channels and directions. But the division assigned me is their consideration from the standpoint of the health officer, and I shall treat communicable diseases in their common interpretation, meaning thereby, as the words of the law express it, "contagious, infectious and pestilential diseases," referring to epidemic diseases such as cholera, small-pox, scarlet fever, diphtheria, measles, typhoid and typhus fevers, etc. As I have already said, we are all of us violators of natures laws, but in different degrees, for in every community there reside some who are violators and sinners of the grossest kind, either through wilfulness, negligence or ignorance. But nature is no respecter of persons. If the sinner reside in a palace and is a giant in intellect and education, or lives in a hovel and is ignorant to the last degree, when he trespasses too far upon nature's rules, he is punished, and there is but one mode of punishment, disease and suffering; unfortunately not to himself alone, but to innocent victims.

The legislature of the State of Michigan supports a State Board of Health, and one in which the citizens may justly take pride, for after its pattern other State boards have molded and copied. The legislature has also enacted certain laws and appointed certain officers to enforce these laws governing sanitary and hygienic matters, all tributary to the State Board. Among these officers is the Health Officer. Being a representative of this class, I know of no better opportunity than right here to instruct the community what their duties and his are, and the relations of one to the other, that they

may understand them, and intelligently aid the Health Officer in the enforcement of them. I cannot improve upon the language of the statute bearing upon these subjects, and I shall take the time to read it because this is probably new to the majority of this audience.

"**Householders and Physicians** must immediately give notice of the first case and of every case of scarlet fever, to the health officer or to the board of health. This is required by sections 1734 and 1735, Compiled Laws of Michigan, 1871 (§§ 1675, 1676—Howell's statutes), as amended by Act No. 11, Laws of 1883, which with the new section (50) added in 1883, are as follows;—

"(1734.) SEC. 43. Whenever any **householder, hotel keeper, keeper of a boarding house, or tenant** shall know, or shall be informed by a physician, or shall have reason to believe, that any person in his family, hotel, boarding house, or premises is taken sick with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice thereof to the health officer, the president, or the clerk of the board of health of the township, city, or village in which he resides. Said notice shall state the name of the person sick, the name of the disease, the name of the householder, hotel keeper, keeper of boarding house, or tenant giving the notice, and shall, by street and number, or otherwise, sufficiently designate the house in which he resides, or the room in which the sick person may be; and if he shall refuse or neglect immediately to give such notice, he shall forfeit for each such offense a sum not exceeding one hundred dollars: *Provided*, That this penalty shall not be enforced if a physician in attendance has given to the health officer or other officer hereinbefore mentioned an immediate notice of said sick person, and true name of the disease, in accordance with the requirements of this section.

"(1735.) SEC. 44. Whevever any **physician** shall know that any person whom he is called to visit, or who is brought to him for examination, is infected with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice thereof to the health officer, the president, or the clerk of the board of health of the township, city, or village in which the sick person may be; and to the householder, hotel keeper, keeper of a boarding house, or tenant within whose house or rooms the sick person may be. The notice to the officer of the board of health shall state the name of the disease, the name, age and sex of the person sick, also the name of the physician giving the notice; and shall, by street and number, or otherwise, sufficiently designate the house or room in which said sick person may be. And every physician and person acting as a physician, who shall refuse or neglect immediately to give such notice shall forfeit for each such offiense a sum not less than fifty nor more than one hundred dollars: *Provided*, That this penalty shall not be enforced against a physician if another physician in attendance has given to the health officer, or other officer hereinbefore mentioned, an immediate notice of said sick person, and the true name of the disease, in accordance with the requirements of this section.

"SEC. 50. For each complete notice in writing to an officer of the board of health, in full compliance with the preceding section, requiring from physicians or other persons notices of diseases dangerous to the public health, the physician who gave the notice shall be entitled, on duly certifying that each notice was correct, and when the bill has been duly audited by the board of health, to receive from the township, city, or village, in which the notice was given, the sum of ten cents."

So much for your duties as citizens. Now as to the duties of the health officer.

Some of the duties which the health officer should perform are specified in Act No. 137, laws of 1883, as follows:

AN ACT to specify certain duties of health officers and provide for compensation therefor, in townships, cities and villages where the health officer is not otherwise instructed by the local board of health.

Powers and duties of health officers in reference to diseases dangerous to public health.

SECTION 1. *The People of the State of Michigan enact,* That whenever the health officer of any township, city or village in this State shall receive reliable notice or shall otherwise have good reason to believe that there is within the township, city or village of which he is the health officer, a case of small-pox, diphtheria, scarlet fever, or other communicable disease dangerous to the public health, it shall be the duty of said health officer, unless he is or shall have been instructed by the board of health, of which he is an executive officer, to do otherwise,—

Immediately to investigate the subject, and in behalf of the board of health, of which he is an executive officer,—

To order the prompt and thorough isolation of those sick or infected with such disease, so long as there is danger of their communicating the disease to other persons;—

To order the prompt vaccination or isolation of persons who have been exposed to small-pox;—

To see that no person suffers for lack of nurses or other necessaries because of isolation for the public good;

To give public notice of infected places by placard on the premises, and otherwise if necessary;

To promptly notify teachers or superintendents of schools concerning families in which are contagious diseases;

To supervise funerals of persons dead from scarlet fever, diphtheria, small-pox, or other communicable disease which endangers the public health;—

To disinfect rooms, clothing, and premises, and all articles likely to be infected, before allowing their use by persons other than those in isolation;

To keep the President of his own board of health, and the Secretary of the State Board of Health constantly informed respecting every outbreak of a disease dangerous to the public health, and of the facts so far as the same shall come to his knowledge, respecting sources of danger of any such diseased person or infected article being brought into or taken out of the township, city, or village of which he is the health officer.

Provisions to have force of regulations of local boards of health in certain cases. Penalty for violation of provisions.

SEC. 2. In the absence of regulations conflicting therewith, made and published by the local board of health, and still remaining in force, the provisions of section one of this act shall have the force of regulations made and published by the local board of health; and whoever shall violate the provisions of section one of this act, or the orders of the health officer made in accordance therewith, shall forfeit for each such offense a sum not exceeding one hundred dollars.

Compensation of health officer. Proviso.

SEC. 3. In the fulfillment of the requirements of this act, the health officer, unless other provision shall have been made in accordance with law, shall be entitled to receive from the township, city, or village of which he is health officer, compensation at the rate of not less than two (2) dollars per day: *Provided,* That this section shall not be construed to conflict with any action by the local board of health, under section sixteen hundred and ninety-three, of the compiled laws of eighteen hundred and seventy-one, as amended by act number two hundred and two, of the laws of eighteen hundred and eighty-one.

By this you will observe that the health officer is not a mere figure-head, an officer in name only, but one vested with authority by the commonwealth to enforce certain regulations whenever any disease dangerous to public health breaks out, and to the best of his ability to guard against the introduction of disease or the fostering of disease germs through uncleanliness or neglect on the part of the community; and it is incumbent on the citizen to assist this officer in the intelligent discharge of his duty. Whenever anything comes to the notice of the citizen that is likely to be prejudicial to good health in the community or to breed disease, it is the duty of that

individual to constitute himself health officer *ex-officio* as a citizen and report the nuisance or the circumstance to the proper authority.

If your neighbor had an infernal machine composed of dynamite, nitroglycerine, or some other explosive material about his premises, you would not be slow in reporting to police headquarters the dangerous character of the instrument whereby the lives of yourself and family were jeopardized, and why should you hesitate when, unconcealed, before your eyes, your neighbor has in his back yard a foul and leaky privy vault, stagnant water or decomposing slops of all kinds, in his cellar decaying animal or vegetable matters, which may establish communication with your well and the water you drink. Here you have an infernal machine liable to do its fatal work more slowly it may be, but none the less surely than the anarchist's bomb. If under such circumstances one or more of your children dies of diphtheria, scarlet fever, typhoid fever and the like, can you conscientiously agree with the officiating clergyman at the funeral or take comfort from his words that "the ways of Providence are deep and mysterious"? The ways are often no deeper than the drainage between an adjacent privy vault and your own well, the water from which poisoned your child, and did its fatal work. A few days ago a woman in Georgia put strychnia in a neighbor's well, the family were taken violently and dangerously ill; the cause was discovered and the woman arrested. Great excitement naturally prevailed in the locality, and if any of the victims die, she will be tried for murder. Where one such willful, isolated case as this can be shown, the records at the office of the State Board of Health can show many instances where men and women have poisoned their neighbor's well through ignorance or carelessness of well established hygienic laws. The neighbor's family sickens and dies, but the perpetrator goes unpunished. There is no law in this country that covers murder committed in this way.

It is then your business as citizens to see that you, your family and your neighbor observe proper hygienic laws. You are indeed your "brother's keeper." It is your right and protection to be so. The State of Michigan by her laws gives you this right, and you are culpable if you do not avail yourself of it. But take care that you remove the "beam out of thine own eye," and see clearly the "mote in thy brother's." Be particular that your own habits, dwelling, and surroundings are as they should be. Set an example to your neighbor. If he is a sensible man he, too, will see that his property is clean and wholesome. If he will not, then it is your duty to call upon the proper authority, the health officer, to compel him. But when a contagious disease actually does appear, what then? The duties of the health officer and the citizen are still demanded, and activity and work on the part of both required. If you know or suspect a case of contagious disease in the community it is your duty to report it to the health officer, and it is his duty to investigate it. If the health officer finds it to be a genuine case it is his duty to isolate it, to publicly proclaim the presence of the disease by placarding the house, to see that the patient does not suffer from lack of medical attendance and nursing, and to take what other measures and precautions he sees fit for the interest of the patient and the community. Since 1883 there has been a law which requires an infected house to be placarded. In a few instances in my service as health officer, objections have been raised by the head of the family against putting a placard upon the house, but the difficulty has always been settled by merely showing the law, copies of

which the State Board of Health liberally distributes. I cannot see why any one should object to a placard. What harm can it possibly do? On the other hand what an amount of good it accomplishes! It is a protection alike to the afflicted householder or tenant as well as to the community. Why to the householder? Because, if the fact of a contagious disease is kept secret and you or your child walk innocently into that infected dwelling and contract the disease, the individual, in whose family the disease exists, is liable to criminal prosecution. What is more, you can enter civil suit against him and by law compel him to pay all damages. Now you can see how the harmless placard is a protection to all parties concerned. If it is on the premises, "even he who runs may read" that there is danger, and if any one persists still in exposing himself to contagion no one else can be blamed or held accountable for results. Thus is the placard a protection and shield alike to both householder and community. After recovery or death, the house in which the disease existed, the clothing of the sick person and of the attendants, and all articles in the house must be thoroughly and completely fumigated. This is law, too, and must not be neglected, for otherwise the germs of disease are retained and propagated. Time forbids the consideration of this important subject here, but every health officer should see that disinfection is carried out.

Every community can do much to protect itself against epidemics of communicable diseases. Let every individual citizen see that he himself and all things pertaining and belonging to him are clean. Not only when disease has a foothold, but at all times be clean, be careful. Aid the municipal health authorities in the performance of their delicate and responsible duties. When small-pox appears in the community we are filled with horror, and yet to a physician or a sanitarian it is not so much to be dreaded as some other far more common disease. Why? Because science gives us an almost sure preventive of small-pox, and by availing ourselves of it we can save a community. But when diphtheria, scarlet fever, typhoid fever and the like come to us, we are reasonably filled with dismay and dread. I, as a physician, so far as my personal safety is concerned, would rather attend small-pox than diphtheria and scarlet fever, because in the former I have a protection for myself and I can protect the other members of the family and the attendants, but in the latter diseases I have no sure protection, and can promise none to others. Visit the cemetery across the river and count the mounds that are there from small-pox, and then count those that are there because of diphtheria, scarlet fever and typhoid fever. If not satisfied still, take the land over and you will learn that for every victim to small-pox hundreds die from diphtheria, scarlet fever, and typhoid fever. Do then what you can (and there is no one so poor or insignificant but can do something) to aid the health authorities in battling these diseases. Cleanliness, caution, proper food and water, isolation and disinfection are the only means science has yet discovered to control and combat many diseases whose etiology is not thoroughly understood. For small-pox we have a mighty and trusty safeguard in vaccination, but for other epidemics we have only the resources referred to. Therefore let every citizen do what he can in the great work of sanitation. Be clean yourself and see that your neighbor is clean. "In time of peace prepare for war." Keep yourselves and dwellings always as though you were at all times surrounded by a pestilence, and if unfortunately your community is visited by a scourge, you have done

what you could to protect yourself, and the chances that you will escape are far greater than those of your more careless neighbor. Vaccination is neglected in communities like this far more than it should be. You only think of protection by vaccination when small-pox is in your midst. Be prepared before and it will cease to be such a dreadful scourge. Root out from your surroundings anything that might prove a productive soil or the propagation of germs of disease.

The position of a health officer is not a desirable one. In towns and small cities usually a practicing physician fills the office. It is a medical office and should be filled by a medical man, but I speak from what I know when I say that a physician in general practice should not be health officer. He cannot afford to be. His salary hardly keeps him in shoes a year, and he sacrifices that little many times over because duty calls him into infected places, which drives patients from him. He also, if he is conscientious and attends to his duty as he should, makes enemies, both among his professional brethren and in the community, by enforcing regulations and restrictions distasteful to many. A reform is needed. A practicing physician, dependent upon his practice for an income, I repeat, cannot afford to be health officer when the pecuniary consideration is no larger than in the majority of small cities. As suggested by Dr. O. W. Wight, late health officer of Detroit, there should be a county health officer whose supervision extends over the entire county and whose entire time is employed, with a sufficient and fixed salary. But imperfect as the present system is, many health officers do good and telling work, but at a personal sacrifice, whereby thousands of dollars and many valuable lives are saved to the community every year. The community is benefited at the personal sacrifice of the health officer whose reward comes from the possession of a "clear and quiet conscience," and not in the accumulation of this world's treasures.

PREVENTION OF COMMUNICABLE DISEASES FROM THE STANDPOINT OF THE CLERGY.

BY REV. B. S. TAYLOR, M. D., OF ALBION.

As I am to represent the clergy to-night, it may be proper for me to say a few words from the standpoint of christian ethics, in justification of the measures employed to prevent the spread of communicable diseases and to discover means for the more successful treatment of them.

It is a general rule in political economy that the interests and convenience of the individual are to be sacrificed when necessary for the public good. In perfect harmony with this, and indeed as the basis of this, the rules of the christian religion forbade our gratifying ourselves at the expense of others, and teach us to deny ourselves for the good of others. According to this rule we certainly do not wish to expose other people's children to dangerous disease by sending our own infected children to school, or by any other means. It may seem to us heartless and unmindful of our already lacerated feelings to hurry away our loved dead to the grave without that delay and

formality which custom has conceded to the feelings of the bereaved, but a little reflection ought to satisfy us that the christian rule of self denial for others' good is not lifted from us even when we are sitting beneath the shadow of a great sorrow. We are still a part of the human family. Public sympathy has conceded to us in this case a degree of consideration above that awarded in ordinary circumstances; but amid all this darkness we are not to forget the welfare of others, or to suppose ourselves released from the obligations of the golden rule.

The extensive experiments which have been made to discover the germs of various diseases seem to me justifiable, proper, and useful. Although the discovery of the particular form of bacteria may not blot it out of being or greatly contribute to the more successful treatment of the disease, yet the discovery of the conditions which favor its growth and propagation, may suggest preventive sanitary measures which will tend to limit the prevalence of the disease.

I think we can also justify the extensive experiments of Pasteur and others in inoculating animals with the virus of contagious diseases, with the hopes of discovering means to cure such diseases in man. The essential equal worth of all mankind, and the value of the immortal being, forbid experiments upon human beings which endanger human life. The only ground upon which we can justify the taking of the life of animals in such experiments is that it is for the benefit of the higher order of being,—man. This expression, "higher order of being," is very offensive to Americans when applied to different classes or kinds of human beings, but it may well be employed of man in comparison with brutes. The Bible places man at the head, and gives to him this world for his use, and teaches that he is of more value than many sparrows. This does not justify man in taking the life of animals for sport or to gratify his savage pleasure of killing. It does justify man in killing animals in his own defense, for food, and for the purpose of securing to him health and immunity from disease. I am not prepared to say to what extent these ends have been secured, but there seems to be a great probability of valuable results. If physicians, by this means, secure control over the most dreaded of all communicable diseases, hydrophobia, we may certainly regard it as a great blessing secured to humanity.

I wish, in this connection, to emphasize one of the motives which inspire the labors of physicians and boards of health in their efforts to restrict and limit these diseases. The purpose of these labors is the protection of society. We are a part of society. It may be said, then, that the motive is our own safety. Even if it be so, there is no wrong in adopting measures for our own protection. I do not admit the validity of the old statement—"Self preservation is the first law of nature"—as a rule of conduct. It may be the first law of nature as an instinctive impulse, but it is not the first law of duty, in the light of christian ethics. Indeed, the whole spirit of christianity is the direct reversal of this rule. That old rule had no place in the life and doings of the founder of christianity, but all his life was a sacrifice of self for the good of others, and this is the essence of christianity up to the present day. A higher rule is imposed upon the animal instincts, a rule which exalts benevolence above selfishness, and makes that the controlling motive of life. As far as this leaven of christian motive pervades society, rules of life and laws of conduct take their place on the higher plane.

I do not think that physicians and boards of health in forming rules for

the restriction of disease have been actuated by motives of self protection. Indeed, we find among physicians many instances of extreme disregard for personal safety in their efforts to benefit others and save society. Others may shun the infected dwelling, but they are by the bedside of the sick and dying. Others may flee from the town or district where small-pox or yellow fever is raging, but they are to stand at their post and breathe continually air laden with the living seeds of disease. I will relate an old and to some of you perhaps a familiar incident. An unknown disease appeared in France. It was rapidly and terribly fatal. Physicians could not intelligently plan their treatment, because they knew nothing of its pathology. A young physician volunteered to examine post mortem the body of a man who had died with that disease, in hopes of obtaining some information that would enable others to treat it more successfully, although he knew it would cost him his own life. He did so and recorded on paper his discoveries that they might be of use to others, though he were dead. There are heroes in the medical profession laboring for the good of man.

We, as ministers, are permitted to point out one way of limiting the fatality and spread of this class of diseases. It is well known that fear is one cause of the rapid spread and fatality of such diseases. When the cholera prevailed in this country years ago, physicians all agreed that great fear of it was a predisposing cause of it in many cases and a great obstacle in the way of successful treatment. Still more has been said of the effect of the mind in cases of hydrophobia. A case has recently been going the rounds of the papers in which the man recovered from the first attack, but on the same day in every successive year suffered a like attack, until the twenty-fifth year, when he died. In this case the recurrence of the disease was attributed solely to the effect of his mind upon his body. All physicians know that an anxious, excited state of mind tends to aggravate the symptoms of diseases, and that a calm and undisturbed state of mind tends to diminish their severity. Now there is power in the christian religion to allay all anxiety and excitement in the presence of danger, and to produce that serenity of mind which is the best safeguard against attacks, and more favorable for recovery. This is not fiction or a rhetorical myth. I know some will have doubts in reference to it, and others may not attach much importance to it. They may say: "I do not see but that professors of religion are as much alarmed and excited on the approach of disease as other people." There may be much ground for such a statement, but it is certain that those of whom this can be said have not experienced all the power there is in religion, and are still strangers to that perfect acquiescence in the will of God and that confiding trust which gives the soul that rest promised in the word of God. The instances are too numerous and too common where religion has delivered from all fear and anxiety in the presence of danger for us to question its power, when people avail themselves of all that it can bestow. Many recoveries must be attributed to that calmness which religion gives. If sanitary science has not taken religion into account as affecting health and disease, I fear it is another of those cases where religion is supposed to be proper enough for the house of God and the Sabbath day, but out of place among the secularities of life. But that which has performed so large a share in the progress and elevation of the human race, that which has so affected human life in its domestic, social and civil relations, has not failed to affect the sanitary condition of mankind. We cannot concede to the greater

diffusion of general intelligence and the progress in sanitary science, much as they have done, all the improvement in the sanitary condition of mankind which the ages have brought. If the christian precepts of cleanliness, temperance, sobriety and chastity were more generally observed, there would be far less occasion for legal restriction than now.

Not only do physicians sometimes fail to appreciate religion as a sanitary agency, but I think they sometimes mistake the effects of religion upon the sick. No doubt excitement of mind and anxiety are disadvantageous in sickness, but there is no anxiety so detrimental as great anxiety to recover, leading to constant thought and frequent questioning in regard to the probable results. Physicians frequently endeavor to allay this anxiety and prevent its unfavorable effect by encouraging hope of recovery when they have little hope themselves; but in many cases these efforts lack that positiveness which can give assurance and rest. Not many months ago I heard a man who was going down with consumption make use of these precise words: "The doctor tells me I am going to get well, but he tells it in such a way that I do not believe him, I know he is lying to me all the time." No doubt a well grounded hope of recovery may have some effect to allay anxiety and facilitate the end desired, but it leaves the patient still with the thought that possibly it may not be so, with the constant disposition to watch his own symptoms and feelings from day to day, and to weigh the question in his own mind. Far more effective is that quiet which is virtual indifference to the result, which says "It is all well, however it may turn; I am not at all anxious about that—'For me to live is Christ, to die is gain.'" Nothing can calm the anxiety and unrest of one in the contemplation of death like a sense of the divine Father's care and assurance of eternal blessedness in the world beyond. On this account I think that physicians sometimes mistake when they forbid religious conversation with the sick. With a somewhat extended experience in visiting the sick, I have never seen any unfavorable results follow. Even the simple fact that one in whom the patient has confidence is offering a prayer to God in his behalf is comforting and quieting to his unrest. I have always noticed that those physicians who know most of the effect of religion upon the mind, by their own experience of it, are the most ready to allow religious conversation with the sick, while those who know least of it are most disposed to forbid it.

PREVENTION OF COMMUNICABLE DISEASES FROM THE STANDPOINT OF THE LAWYER.

BY R. LOUD, ATTORNEY, ALBION.

Laws that may be enacted for the preservation of health are as praiseworthy and commendable as any laws that have been passed for the benefit of humanity, and indeed in its broadest sense the result and inevitable effect of every right law, as a rule of conduct, must be for the benefit of mankind from a sanitary point of view. The individual, whether protected in the exercise of his absolute or of his relative rights, must be benefited by the enforcement of all proper laws, whether their object be the enforcement of the obli-

gations of contracts, or the police regulations of a municipality. If the old legal maxim, "*sic utere tuo ut alienum non laedo*" (so use your own that it shall not injure another's), were obeyed, the general health of the community would be enhanced, and there would be less sickness and disease. To illustrate, take the matter of drainage, the cleaning of vaults, the removal of filth and garbage, the suppression of noxious weeds, and the observance of the laws relative to light and air, the smoke nuisance, and a thousand other instances that might be enumerated. If every man would so act and manage his business affairs as to have a due regard for the rights of others, he would promote the public health and help to prevent the spread of disease. If my neighbor's premises are filthy, or if he throws filth or directs drainage onto my lands, my health and the health of my neighbor is endangered. So if men could be taught that it is their moral duty to keep clean, to keep everything about them clean, much could be accomplished in the way of prevention of disease; but this is a slow, tedious and often unsatisfactory process. Education, to accomplish anything of importance, must begin in childhood and continue through life, and even through generations. So the police power of the State is invoked, and laws are made to prevent and restrict communicable diseases; but when we know that all such laws depend largely for their enforcement upon public opinion, and the sentiment of any particular community, we are brought right back to the moral law, or the moral duty of the individual, which can only be inculcated by long years of education and training.

The ignorant Polack or negro who may never bathe, or wash even his face and hands, will tell you that dirt is not harmful,—that his father and mother never washed, and they were healthy and lived to a good old age. In the enforcement of these laws pertaining to health, the executive power has to combat the preconceived opinion of generations of ignorance and error, and I have heard men, otherwise intelligent, express the same idea,—that a reasonable amount of dirt was beneficial to health.

Laws for the protection of health are as old as any laws relative to the rights of persons. We read in Blackstone that "Injuries affecting a man's health are where, by any unwholesome practices of another, a man sustains any apparent damage in his vigor or constitution, as by selling him bad provisions or wine, by the exercise of a noisome trade which affects the air in his neighborhood, or by the neglect or unskillful management of his physician, surgeon or apothecary. For it hath been solemnly resolved that *mala praxis* is a great misdemeanor and offence at common law, whether it be for curiosity and experiment, or by neglect, because it breaks the trust which the party had placed in his physician, and tends to the patient's destruction."

As population becomes more dense the necessity for sharp supervision and rigid enforcement of such laws increases. The unhealthy condition under which men live in cities, especially in tenement districts, where human beings are packed closer than sardines in a box, are simply appalling. In 1790, when there were but four American cities with a population of more that 10,000, and when the population of the largest was but about 40,000, it was easy for our people to relegate all matters relating to the prevention of disease to individual care, but now it is quite a different matter, when nearly one-fourth of our people live in cities, when a single city, with its surroundings, contains almost as many persons as the whole United States in 1790. The conditions of our American life have thus far been conducive to a low death-rate.

London, Liverpool, and Manchester are far ahead of us in their management and control of these matters, and especially in consuming the smoke from their factories, rendering it much less offensive and injurious to health.

All sanitary legislation should be entirely free from political or partisan influence. Legislators should see to it that proper laws are enacted to aid municipalities in fighting off disease. The trouble seems to be not so much in the paucity of our laws, as in the proper enforcement of those we have. Think of two well developed cases of leprosy in Philadelphia and one in Minneapolis in this enlightened age. True, it is claimed that the two cases in Philadelphia were smuggled into the city, but that such a thing is possible shows the inefficiency of the authorities whose duty it is to execute the laws. How often do we see filth and other matter dangerous to public health allowed to accumulate in our cities, and all for the want of proper officers to enforce the laws. Again, some laws are invoked and distorted from their true spirit and intent by grasping and avaricious men, for their self aggrandizement. Take for example the drain law, as applied to swamps and marshes, and let me say here that we are making a grand mistake, especially here in Michigan, in allowing our lakes to be drained, and their beauty spoiled forever. So say nothing of the desecration of the fair face of nature, it is absolutely injurious to health and a positive damage to all the surrounding country to drain the lakes and ponds upon which it borders. It also lessens the amount of rain-fall and renders our country more subject to drouths. It diminishes the humidity of the air and renders the upland less productive by depriving it of the moisture that permeates the surrounding soil, while in most cases it is injurious also to marsh and swamp lands that are made dry, producing a soil that will burn like tinder, and killing all grass fit for pasturage. To prove this one has only to visit our once beautiful Spectacle Lake and its surroundings, and witness the results of the withering touch of the drain law. Let us see what is said to be the object of this law. We read from the law, "That water courses, ditches and drains for the drainage of swamps, marshes and other low lands, may be established, constructed and maintained in the several counties and townships of this State for the benefit of the public health, under the provisions of this act." Application may be made by any three freeholders of the county, thus placing it in the power of three men who may live miles away from the lands to be drained, to set the law in motion. This would seem to proceed upon the theory that the object of the law is the public health, but how true it is that generally the three petitioners are actuated by sordid motives purely, and a desire to add a few paltry acres to their already opulent farms. Will anyone have the hardihood to say that it has inured to the benefit of the public health to destroy such beautiful bodies of water as were Spectacle Lake and Duck Lake before they were drained? On the contrary, is it not absolutely injurious and detrimental to health, and ought such vandalism to be permitted? Laws relative to public health should be enforced in their true spirit, and not for mercenary purposes.

The indiscriminate destruction of our forests is sure to bring drouths and tempests in its train. Instead of the mild, gentle rains of former years, which are so beneficial to vegetation, we are experiencing floods and blizzards, and other atmospheric extremes. The mighty monarchs of the forests protect with their broad, spreading arms the virgin soil (causing it to retain the

moisture which gives it life) and temper the elements with gentleness and moderation.

Even now as I write, Michigan is suffering in some places for want of water and is in danger of being deprived of the comforts and conveniences of an abundant water-supply. The proceedings, recently published, of the State Board of Health show that from March to September the rain-fall was far below the average for the nine years from 1878 to 1886 inclusive. They show also a marked increase in the prevalence of typhoid fever, notwithstanding the efforts of the Board for the prevention and restriction of this disease. As it is evident from all the facts attainable that forests are beneficial to the public health, how imperative it is that we should have and enforce laws for the preservation and renewal of these "pathless woods." But when we consider the obstacles to be surmounted in the enforcement of such laws, the wealth and influence of soulless corporations to be encountered and overcome to bring about even the passage of them, when monopolies control legislation, —as Wendell Phillips said of Tom Scott the once great railroad king: "With one hand on the Atlantic, the other on the Pacific, he makes vassals of pigmy legislatures,"—when we consider the mighty work before us, and the fruitless endeavors of the reformers of the past in their fight against the power of money, our resolution falters, and "meek-eyed patience folds her hands in despair." But the discussion of these questions will accomplish much. A great moral lever is being placed under the mass of corrupt and venal legislation. The individual is being educated into a more perfect manhood, and is taught to believe that "cleanliness is next to Godliness."

Public sentiment must be educated, and the individual brought to the conviction that it is his highest moral duty to sacrifice some part of his personal liberty for the general good, to submit to many personal inconveniences, as for example to be quarantined in time of danger, shut out from the society of his friends, and prevented from attending to his necessary business affairs, so that the good of the whole may be conserved.

The question, however, of how far the State may interfere with the liberty of the individual for the general good is a subject too comprehensive for this paper. I will only add that this society has a great work before it, and by proper endeavor can accomplish much.

THE PREVENTION OF THE COMMUNICABLE DISEASES,

FROM THE STANDPOINT OF THE STATE BOARD OF HEALTH.

BY HENRY B. BAKER, M. D., SECRETARY OF THE MICHIGAN STATE BOARD OF HEALTH, LANSING.

Since this topic was assigned to me I have not had an opportunity to obtain a formal expression of the views of the State Board of Health on the subject, therefore the Board should not be held responsible for all I may say; but, judging from its work during the past fourteen years, the Board, evidently, believes that the "Prevention of the Communicable Diseases" is one

of the most important measures which can engage its attention, and that work for this purpose is the most important that local boards of health can undertake. It is not difficult to imagine why this is true, because, by studying the vital statistics, it is found that the diseases which cause the greater proportion of the premature deaths in Michigan are the communicable diseases. Named in the order of their importance, the five diseases which cause most deaths in Michigan are: (1) consumption, (2) diphtheria, (3) pneumonia, (4) typhoid fever, and (5) scarlet fever. Excepting perhaps pneumonia, these are all communicable diseases; in common parlance, they are "catching;" not all of them are contagious, but all are in some manner spread from person to person. It thus appears not only that the communicable diseases have caused a large proportion of the premature deaths, but a large proportion of *all* the deaths; and that if we should prevent these communicable diseases we would change the character of our vital statistics,—a much larger proportion of our people would die in ripe old age, a much larger proportion of the living inhabitants would be in the vigor of youth, and in the productive and enjoyable period of middle age; there would be prevented in each year, in this State of Michigan, two or three thousand deaths of children from diphtheria and scarlet fever, and perhaps a thousand deaths of persons in the prime of life, from typhoid fever. Knowledge of these facts should prompt to greater efforts for the prevention of these diseases, and, inasmuch as we now know how to prevent them, it seems strange that people do not uniformly act for their prevention. Probably the people would so act if they all knew that so large a proportion of the mortality is caused by these diseases, that they *are* preventable, and especially if all knew just *how* to prevent each one of these diseases.

These Sanitary Conventions do much to spread such information; but they do not reach the people of the whole State fast enough, and the local boards of health, engaged as they are, in the active work of restricting diseases which should have been prevented, and in other practical sanitary work, need the aid supplied by the different lines of work carried on by the State Board of Health, in order to spread that information which is essential to induce the people generally to sustain and coöperate with the local health authorities in restricting and preventing these diseases.

SOME OF THE WORK OF THE STATE BOARD OF HEALTH.

By means of reports from local health officers, physicians and others, and in all practicable ways, the State Board of Health collects information on these subjects; and in all practicable ways it seeks to spread this information "where it will do the most good." It aims to "strike while the iron is hot"—that is, it tries to have the information which it collects, and the best advice which it can give placed before people at such times that it will be most likely to be accepted. Pamphlets, such as are distributed in this audience, containing concise statements of facts and directions how to restrict each one of these communicable diseases, are sent to localities where the diseases occur, to be distributed to the neighbors of the families in which the communicable disease occurs, because at such times of danger the neighbors will be most likely to read such pamphlets, and because after reading them they will then be most likely to coöperate with the local health officer for the restriction of the disease. Thousands of pamphlets on each of the most

dangerous communicable diseases are distributed by the State Board. They are being distributed all the time. In order to distribute each kind of pamphlets in the localities where there are persons sick with the particular communicable disease of which that kind of pamphlet treats, it is necessary to know the localities in which each such disease occurs; and this information to the office of the State Board is provided for by a law which requires every health officer in the State to keep the Secretary of the State Board of Health constantly informed on this subject. There are in Michigan over 1,400 local boards of health,—each one required by law to have a health officer. The law requires every householder and every physician who knows of a case of one of these dangerous diseases under his care to promptly notify the health officer or other officer of the local board of health. When these laws are faithfully obeyed, the local health officer can take prompt action for the restriction of the dangerous disease, the Secretary of the State Board of Health can promptly supply pamphlets of instructions which the health officer can distribute to the neighbors, and frequently the central office can take other action which tends to aid the local officer in restricting the outbreak and preventing an epidemic; and what is of even greater consequence, in so educating the people of that vicinity that thereafter they will be more ready to restrict that disease, and many of them be able to prevent outbreaks which otherwise would occur. Although this method of teaching the prevention of each of these diseases, while the disease is threatening, seems to be the best that is practicable for the State Board of Health, it seems too bad that it is not possible for the people of a locality to learn before a first outbreak occurs; but something like experience or personal observation seems to be essential in order to awaken sufficient interest in the subject.

But while it is probably impossible to reach the adult population with facts and advice on these subjects faster than in some such way as it is being done by the methods just described, it certainly seems possible, so far as concerns the rising generation, to strike at the root of *this* ignorance which annually causes the death of thousands among us. This leads me to say that, in my opinion,—

THE PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES SHOULD BE TAUGHT IN THE PUBLIC SCHOOLS.

As that knowledge which tends *directly* to the preservation of life is of more worth than that knowledge which tends indirectly thereto, the teaching of physiology and hygiene in the public schools as it is usually done may well be displaced by the teaching of the exact measures required for the prevention of those dangerous communicable diseases which cause the greater part of the deaths. Of course, if the teaching of physiology and hygiene as it is usually taught is of more consequence than some other studies, the displacement should be of such other studies; but the thought I wish to convey is that whatever is displaced it is of prime importance for the welfare of humanity that the exact principles of the prevention of those diseases which cause the most deaths should be taught in the public schools. It is as true now as when the Bible was written that "my people are destroyed for lack of knowledge."*

* Hosea, Chap. III., 6.

When the present methods of teaching "physiology and hygiene" were invented, *sanitary science* had not been evolved; but now we know approximately what diseases kill us, and we know how to prevent the most important of them. Is it not high time this knowledge was being utilized by the teachers throughout this country, for the saving of the lives of those whom they are educating?

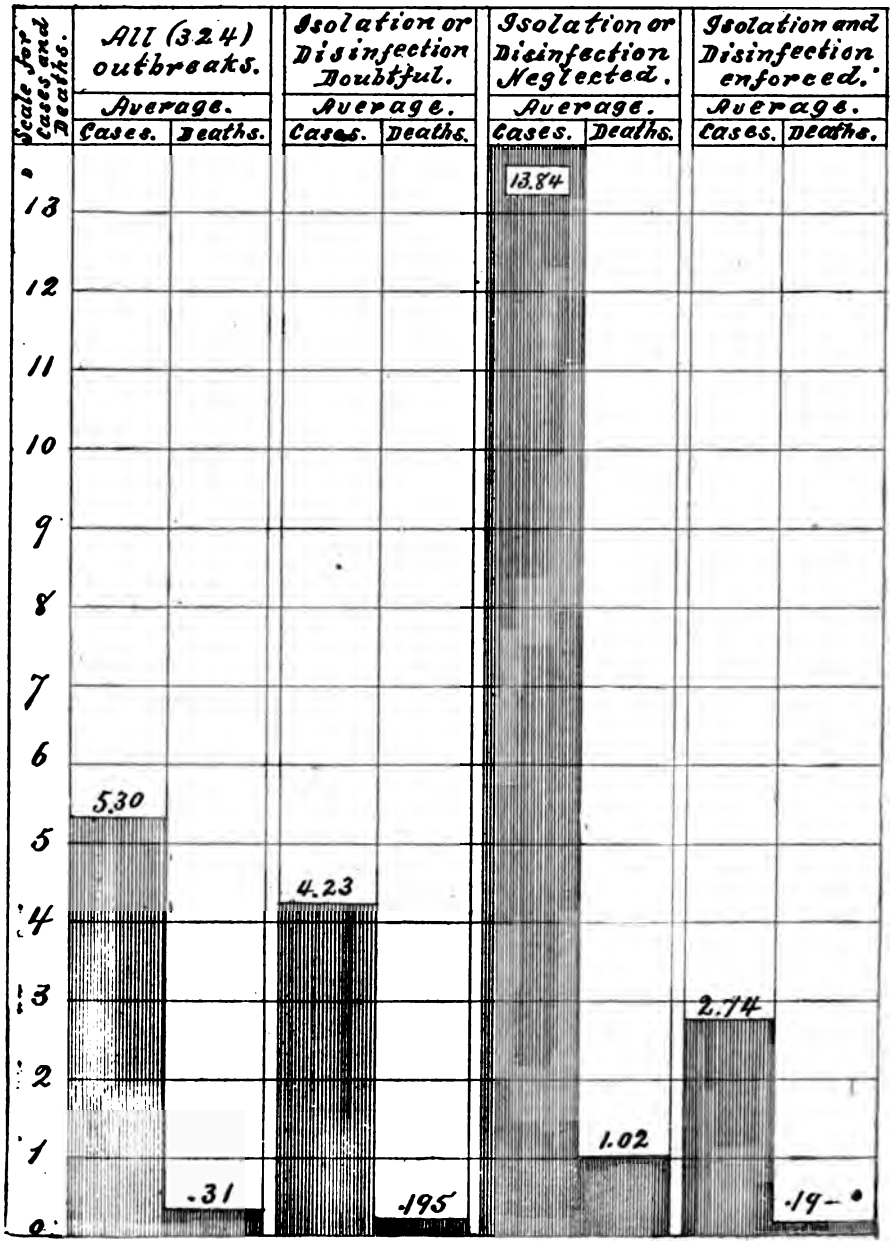
Here let me answer the question which some of you are wishing to ask—How do we know that we have that valuable knowledge directly useful for the saving of life? The answer is: Because whenever we act upon that knowledge the saving of life follows, and it follows so uniformly that we have come to believe that it is a result of such action. A few illustrations on a large scale are as follows: Computations, made and published a year or two since* show that since the State Board of Health was established, and the approved methods for the restriction and prevention of small-pox have been attempted, the deaths from small-pox in Michigan, returned to the office of the Secretary of State, have been much less than during the five years just before the Board was established. Compared with that period, and making allowance for increase of population, about 1,000 persons appear to have been saved from death from small-pox in Michigan during the eleven years, 1873–84. Similar computations indicate that about three thousand persons were saved from death from scarlet fever in Michigan during the same period of time.

Coming down to a more recent period of time, official reports from the health officers in Michigan for the year 1886, have been compiled, under my direction, by Mr. George E. Willitts, whom many of you know as at one time a student at the College in this city. Among the pamphlets distributed in this audience you may see two diagrams which exhibit graphically some important facts worked out by Mr. Willitts, in the office of the State Board of Health. From the diagram relating to scarlet fever, you may see that while in those outbreaks in which isolation or disinfection was neglected there was an average of nearly fourteen cases to one outbreak, in those outbreaks in which both these approved measures were enforced, there was an average of less than three cases to an outbreak—therefore, there were eleven cases to an outbreak saved by the more perfect methods, namely by isolation and disinfection. That is, in the fifty-eight outbreaks in which the more perfect methods were enforced there was, compared with those of less perfect methods, a saving of 638 cases of sickness and forty-eight lives from this one disease in a single year. Probably the saving of life and health through efforts at the restriction and prevention of scarlet fever in Michigan in that year were many times what these figures show; but these figures supply a scientific basis for the comparison of two methods of action. The facts are obtained from the official reports of the health officers in whose jurisdictions the outbreaks occurred, and they are reliable so far as relates to all outbreaks properly reported.

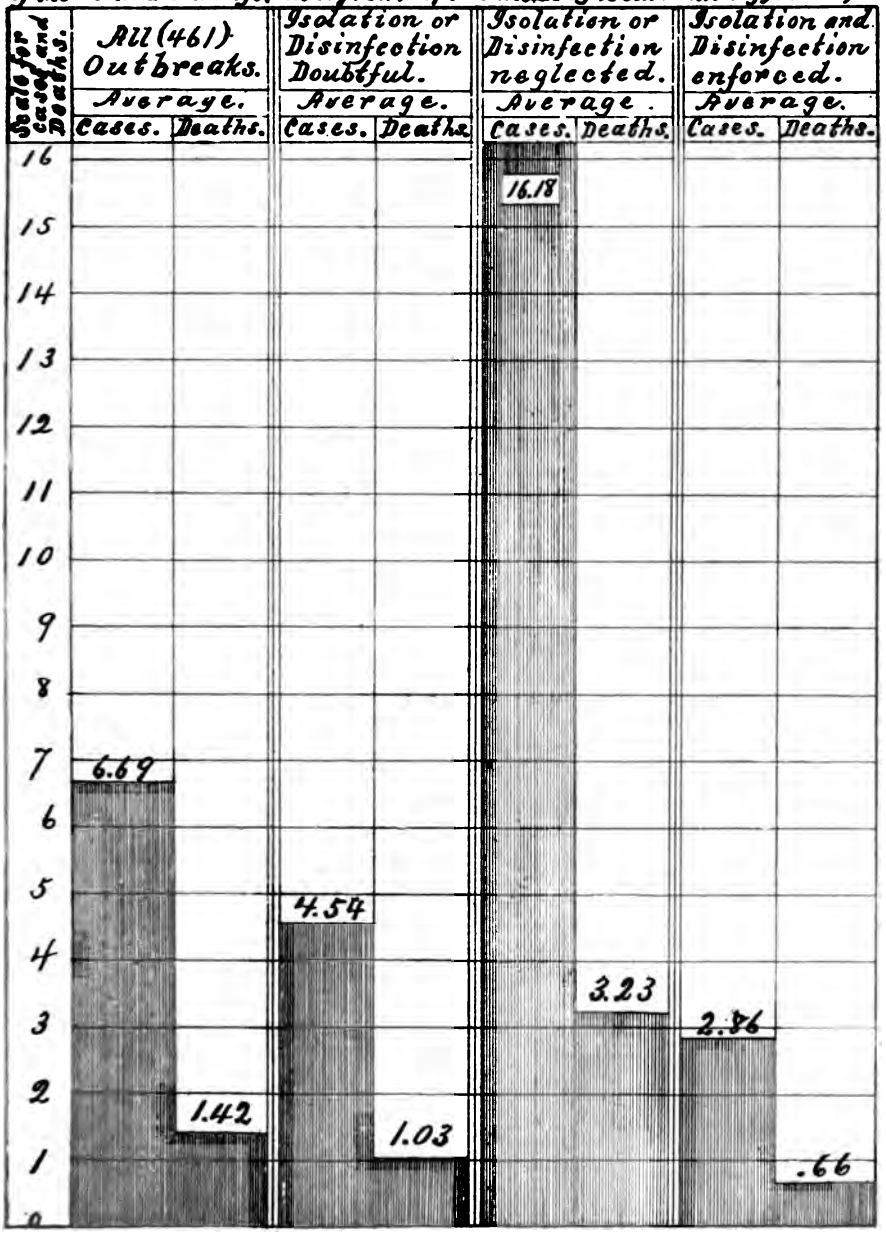
The other diagram before you, relating to diphtheria in Michigan in 1886, shows even a greater saving of life and health through efforts for the restriction and prevention of that disease, there being an average of over sixteen cases to an outbreak in those outbreaks in which isolation or disinfection was neglected, while there were less than three cases to an outbreak

*Proceedings, Michigan State Board of Health, pp, 11-16; Annual Report Michigan State Board of Health, 1886, pp. 177-181.

Scarlet fever in Michigan in 1886: The Average Numbers of Cases and Deaths per outbreak:-1, in all the 324 outbreaks reported; 2, in the 221 outbreaks in which it is doubtful whether or not Disinfection or Isolation were secured; 3, in the 45 outbreaks in which Isolation or Disinfection or both were neglected; and 4, in the 58 outbreaks in which Isolation and Disinfection were both enforced. (Compiled in the office of the Secretary of the State Board of Health from reports made by local health officers.)



Diphtheria in Michigan in 1886, exhibiting the Average Numbers of Cases and Deaths per outbreak:- (1) in All the 461 outbreaks Reported, (2) in the 243 outbreaks in which it is Doubtful whether or not Disinfection or Isolation were secured, (3) in the 102 outbreaks in which Isolation or Disinfection or both were neglected, and (4) in the 116 outbreaks in which Isolation and Disinfection were both enforced. (Compiled in the office of the Secretary of the State Board of Health from reports made by local health officers.)



in those outbreaks where both isolation and disinfection were enforced,—a saving of over thirteen cases and over two deaths to each of the 116 outbreaks in which the more perfect methods were employed, compared with those outbreaks in which one important part of the work was omitted. This indicates that in the 116 outbreaks alone there were saved 298 lives and over 1,500 cases of sickness from diphtheria in Michigan in a single year by improved methods for its restriction and prevention.

These computations from official reports are submitted, not as indicating the total saving of life and health from diphtheria and scarlet fever in that year by such efforts as are recommended by the State Board of Health, but as supplying positive evidence that these diseases *can* be restricted and in great part prevented whenever the people and their officers coöperate promptly and fully in obeying the laws, and in carrying out the advice which is freely given by the State Board of Health.

If you ask what is that advice which the State Board of Health gives,—what, in its opinion, are the best known measures for the restriction and prevention of each of the dangerous communicable diseases,—I must say that the time at our disposal this evening will hardly permit of my stating the advice in full; but it may be said that the methods are not the same for all diseases. Thus, the most important preventive of small-pox is vaccination; and small-pox, diphtheria and scarlet fever are *contagious* diseases, and demand isolation of the sick, and disinfection of the entire contents of the house, or at least of the room in which the disease has been; while *typhoid fever* is probably *not contagious*, but demands the disinfection of all bowel discharges, and especial care for the protection of the purity of the drinking water. The spread of *consumption* may *probably* be lessened by a general attention to the disinfection of all the sputa of consumptives.

But for full though concise statements, I must refer you to the several pamphlets which are published by the State Board of Health for gratuitous distribution, copies of which have been distributed here this evening, and which will be sent from the office of the State Board to any person who wishes to receive and read them, so that, if any person fails to receive them this evening, a postal-card request addressed to the office of the State Board of Health at Lansing, will secure a copy of any one or of each of the several pamphlets which relate to the restriction and prevention of the dangerous communicable diseases.

CLOSING OF THE CONVENTION.

James W. Sheldon then offered the following resolutions, which were passed by a rising vote:

WHEREAS, This large presence as well as the attendance at the several sessions of this convention but bespeaks the interest of our citizens in the several topics under discussion and interest in the deliberations of the convention; therefore,

Resolved, That a vote of thanks be extended to the State Board of Health, its president and secretary, the local board and its officers, the several persons who have furnished papers upon topics under discussion, and also to the local committee and press, all of which have nobly aided in rendering these deliberations services of intelligence and profit to our citizens.

PROCEEDINGS AND ADDRESS

AT A

SANITARY CONVE

HELD AT

MANISTEE, MICHIGAN

JUNE 5 AND 6, 1888,

UNDER THE DIRECTION OF A COMMITTEE OF THE S
HEALTH AND A COMMITTEE OF CITIZENS OF M

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF H
YEAR 1888.]

[No. 280.]

BY AUTHORITY.

LANSING, MICH.
THORP AND GODFREY, STATE PRINTERS AND BI
1888.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

MANISTEE, JUNE 5 AND 6, 1888.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1888.

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

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MANISTEE SANITARY CONVENTION.

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT MANISTEE, JUNE 5 AND 6, 1888.

SUPPLEMENT TO REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1888.

This convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Manistee, acting with a committee of the State Board of Health.

The following persons constituted the local committee: Hon. T. J. Ramsdell, Hon. Wm. G. Baumgardner, Dr. John F. Hincks, Charles F. Ruggles, Rev. J. Snashall, Dr. L. S. Ellis, Edwin Russell, Dr. John Kinsley.

The committee from the State Board of Health consisted of Henry B. Baker, M. D., Lansing.

The officers of the Convention were: *President:* Hon. T. J. Ramsdell; *Vice Presidents:* Dr. Geo. W. Roby, Ludington; A. W. Farr, Onekama; Dr. B. D. Ashton, Traverse City; A. G. Butler, Frankfort; Dr. E. S. Richardson, Reed City; John Hills, Bear Lake; R. G. Peters, Manistee; *Secretary:* Rev. J. Snashall, Manistee; *Assistant Secretary:* Geo. H. Cleveland, M. D., Pentwater.

Among those in attendance at the sessions of the Convention were the following from abroad: E. L. Shurly, M. D., of Detroit; E. S. Richardson, M. D., of Reed City; Geo. W. Crosby, M. D., of Ludington; Wm. Heap, of Muskegon; Arthur Hazlewood, M. D., member of the State Board of Health, of Grand Rapids; J. H. Kellogg, M. D., member of the State Board of Health, of Battle Creek; Henry B. Baker, M. D., Secretary of the State Board of Health, of Lansing.

First Session—Tuesday, June 5, at 3 P. M.

The Convention was called to order by Hon. T. J. Ramsdell, President of the Convention.

ADDRESS OF WELCOME.

Hon. R. R. Blacker, the mayor of the city, was to deliver an address of welcome, but he was unable to attend, and, on opening the convention, Hon. T. J. Ramsdell remarked as follows:—

I do not know what the mayor would say, were he able to be present, but I can assure you who have had the kindness to visit us to-day, that you are welcome. Our people should take a deeper interest than they do in matters pertaining to sanitary science. I am anxious to hear these men, many of whom have come a long distance, discuss these topics with which they are familiar, and the citizens of Manistee should not lose this opportunity of hearing them talk upon this important subject,—the sanitary condition of our city. Maniste is a busy place. We are too much a money-getting people. Our great ambition seems to be to leave a large amount of money for our children to quarrel over. But if a man can give his child a good physique and correct ideas of the laws of health, he leaves him a better heritage than money. So long as our school boards are foolish enough to build our school-houses five stories high, our physicians should call attention to it. The physicians are necessarily in the van in sanitary movements. They do not stop like lawyers to demand a fee, but they are ever ready to sacrifice their lives for the sick. Manistee should be here to-day in mass, but in behalf of those who are here, and in behalf of those who have the best interests of the community at heart, I extend to you a most hearty welcome.

Arthur Hazlewood, M. D., member of the State Board of Health of Grand Rapids, being called upon, in response to the address of welcome, spoke in substance as follows:

RESPONSE AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

BY ARTHUR HAZLEWOOD, M. D., MEMBER OF THE STATE BOARD OF HEALTH, OF GRAND RAPIDS.

This is not a doctors' convention; it is for the people. The State Board of Health endeavors to induce people to look into sanitary matters for themselves, to benefit themselves individually and collectively. Sanitarians study many things which do not belong to the science of medicine. Ventilation and architecture are not branches of the science of medicine, but they are considered of vital importance by the sanitarian. The State Board of Health has in view the prevention of disease, not its cure. We have nothing to do with nostrums, but we are concerned about ventilation, water-supply, sewerage, pure air and pure food. The main object is the dissemination of knowledge which will prevent disease. Many of the subjects here discussed relate to the household, and ladies should be well represented at these sessions.

The State Board of Health, under whose auspices this convention is held, comprises seven members, six of whom are appointed by the Governor. The secretary is appointed by the Board. He is its executive officer and devotes his entire time to the work. The other members of the Board receive no compensation. The Board meets regularly four times a year at Lansing, and holds such conventions as these wherever an invitation is received, and it is thought that good will result.

THE PRESENT AND FUTURE WATER-SUPPLY OF MANISTEE.

BY JAMES A. KING, M. D., OF MANISTEE.

It would seem unnecessary to spend one moment of the time allotted to me to impress upon the minds of this audience the necessity of a pure water-supply.

For over 2,000 years the medical profession has given this subject more or less attention, and if anything is settled in the world it is that much sickness and many deaths are due to the use of impure drinking water; but in view of the fact that many of our best citizens deny that our late endemic of typhoid fever could have been due to the use of infected water, I am constrained to digress from the subject in hand and take up a portion of your valuable time to emphasize the necessity of a pure supply. The argument of those who would discourage any criticism of our water-supply amounts to this: Typhoid fever prevailed in many cities besides our own last summer; those cities did not use our water, therefore it is conclusively shown that typhoid fever is not caused by drinking poisoned water, but by some atmospheric condition. This ingenious argument is worthy of a lawyer, and indeed I have heard more than one lawyer give it, but water is an article of very general use and as some of those cities that had typhoid fever passed the local option law it is reasonable to suppose they drank quite as much water as Manistee did. Then we have Ruggles bath rooms and they have not; it is reasonable to suppose Manisteans are quite as cleanly as they are and that they are quite as likely to have filthy water as ourselves, therefore the argument that, because other cities did not get typhoid fever from Manistee water, water can not be the common carrier of the disease seems thinner than some of the water they are talking about. The fact that in almost every case in which the cause of an outbreak of typhoid fever has been traced at all, it has been found due to the drinking of impure water, the fact that for the last forty years, careful scientific investigations of this subject have been made by hundreds of learned men with the universal verdict that the typhoid germ usually enters the system through the drinking water, ought to silence such arguments as this, and allow the rays of modern science to dispel the darkness of past ignorance. If I were to mention in the briefest way one-tenth part of the evidence regarding the cause of this disease alone as connected with water-supply, I would fill up the rest of my time, and inasmuch as we have had such a terrible scourge here during the past year, I hope the eminent men who follow me in the discussion of this paper will dwell somewhat upon the relation of this disease to drinking water, and impress upon the people of this city, the urgency of intelligent, scientific effort, to prevent the mournful, I may say disgraceful scene of the last year, for to sicken and die through filth and ignorance is a disgrace. Two hundred and fifty citizens sick with a filth disease! It is a disgrace to our intelligence, but it is a greater disgrace to cloak the cause with ignorant excuses, or to consider it as a visitation of a divine providence. Without wasting time then to apologize for my position here—a position no one is more convinced of my incapacity for than myself, nor stopping to beg of my critics to be lenient (this I withhold from them more readily because I know they will do precisely as they choose any way), without respect to prejudices, without fear of consequences, but with a regard alone for the truth, let us plunge into the subject and into the well,

for Manistee at present receives her water entirely from wells, and if we would know all we must go to the bottom.

Well water may be classed as surface and subterranean. Surface water is that which falls upon the ground in the near vicinity, sinks into the earth to the first bed of clay, rock, or other impervious stratum, and flows along upon it until tapped by some shallow well. Subterranean waters are those found beneath at least one impervious layer. This water came from the surface of course, but at some distance from the immediate vicinity, at a point where the water bearing stratum, now many feet down, tilts upward to the surface. It is obvious then that all water was at one time surface water, and while a deep well usually insures a remote origin for the water we obtain, it does not necessarily insure us a pure water. For instance, the point where the deep stratum comes to the surface may be the chosen site of a graveyard, so that, as we quaff, with a relish, the cool and sparkling product of the deep well, we may unconsciously imbibe the active principle of our lamented mother-in-law. "Two paces of the vilest earth is [*not*] room enough;" two miles may be too little. But while the deep well may be impure, the fact that its contents have probably traveled a long way, and the fact that the opportunity for filtration and oxidation increases with the distance, render the waters from deep wells comparatively safe.

We have two public wells in Manistee, (1) that of the Manistee Water Works Co., and (2) the public fountain of C. H. Ruggles. Let us first consider the well of the Manistee water works. This is situated on the corner of First and Cedar streets, about one-half mile west of this hall, and about 100 feet from the Manistee river. The well proper is 35 feet in diameter and 30 feet deep. Nothing but sand and gravel was met with in digging to this depth. At the bottom they struck a stratum of gravel which bore a stream of water that filled the well, in a short time, several feet deep, and flowed on from south to north through the well to the river. There was, I believe, some talk of using this vein to supply the city, but better opinion prevailed, and pipes were sunk from the bottom of the well from 80 to 100 feet to a water bearing gravel, from which the water rises in the well proper, from ten to fifteen feet. In driving these pipes nothing was found for the first few feet but sand and gravel, then a stratum of clay about 8 feet thick, then sand and gravel, a thin layer of clay, more sand, and finally, after passing through clay for about fifteen feet, they struck a water bearing gravel, from which the present supply of water is supposed to be entirely obtained. These are estimates made by the superintendent of the water works, based upon the way the pipes drive. No boring has been made, and there is no positive proof that these estimates are correct. Eight hundred families are now using the water, with an average daily pumping of 600,000 gallons. About 1,800,000 gallons have been pumped at times, and about 2,000,000 gallons is the estimated limit of supply.

Four questions naturally arise here: (1.) Is the quantity sufficient for all possible emergencies? (2.) Is the quality good? (3.) Is there danger of pollution from the river or from any other source? (4.) Is the well properly constructed?

Regarding the quantity furnished, it is not sufficient for every possible emergency. The superintendent assured me that if all their pumping capacity was employed they could exhaust the supply in a few hours. It has been lowered to within three feet of the bottom in times of fire. In such an emer-

gency they have connection with the river from which they can draw an unlimited supply of filthy water, which is daily polluted by the sewers, all of which enter the river above the well.

As to quality, the test is, (1) a chemical analysis of the water, made by a thoroughly scientific chemist, and (2) practical investigation of the effects produced upon the consumer by its use. Four analyses of this water have been made—two by Prof. Victor C. Vaughan, M. D., Ph. D., of the State University, a mineral analysis by Bodie of Milwaukee, Wisconsin, and, four years later than Dr. Vaughan's, we have another sanitary analysis made by Dr. R. C. Kedzie of the Michigan Agricultural College.

I give first the results of the two analyses by Dr. V. C. Vaughan, made in March, 1884, one specimen being taken from the hydrant, the other from the well.

ANALYSIS OF THE SAMPLE OF WATER TAKEN FROM THE WELL.

	Parts Per Million.
Free ammonia	0.04
Albuminoid ammonia	0.16
	Grains Per Gallon.
Na Cl	½
Total solids	10
Inorganic solids	2
Organic solids	8.

ANALYSIS OF THE SAMPLE OF WATER TAKEN FROM THE HYDRANT.

	Parts Per Million.
Free ammonia	0.08
Albuminoid ammonia	.16
	Grains Per Gallon.
Na Cl	½
Total solids	10.0
Inorganic solids	2.0
Organic solids	8.0

Of this analysis Dr. Vaughan says: "Both specimens contain traces of nitrates and nitrites. The limit of free ammonia in drinking water is placed at .05 parts per million when there is much albuminoid ammonia also present. The limit of albuminoid ammonia is placed at .15 parts per million. This places it as you see just outside the limit, and I should not consider it safe even at .15 parts per million." The source of contamination is "probably vegetable." "The water is not safe as it is; however, the danger is not as great as it would be were the contamination of animal origin. I believe the water could be rendered perfectly safe by thorough filtration."

The following is the analysis by Bodie:

	Grains Per Gallon.
Chlorine	0.3861
Chlorate of soda	0.2457
Bicarbonate of soda	0.2398
Bicarbonate of lime	9.5004
Bicarbonate of mag.	4.3352
Protoxide of iron	0.1228
Allumina	0.0819
Silica	0.5265

The next is an analysis made by Dr. R. C. Kedzie, four years after that by Dr. Vaughan. The following is the result:

	Parts Per Million.
Free ammonia	.003
Albuminoid ammonia	.004
Na Cl	1.5
Total solids	18.00
Inorganic	17.00
Organic	1.00
Hardness by Clark's soap test	14°
Temporary hardness by Clark's soap test	9°
Permanent hardness	5°

There were no nitrates, nitrites nor remains of organic life. Oxygen consumed by putrescent organic matter,—none. He says: "Quality of water for potable, domestic purposes, good. The water is very free from organic matter, is much softer than most soil water of the State. The absence of nitrates or nitrites, the small amount of organic matter and the fact that permanganates are not reduced—all point to a good safe water." There is, as you see, a marked difference in these analyses. Either the water is subject to change or some of these men have made a mistake. To charge such a discrepancy to error would be unwarrantable except as a last resort. If after an analysis of a part of the same specimen such a discrepancy existed we might charge it to error, but not so when different specimens collected at different times are taken. Leaving the analysis of Bodie out of the question, as it is a mineral and not a sanitary analysis, and only interests us so far as he states that there is no organic matter, there remain the sanitary analyses of two men of recognized authority giving us widely different results. Both the ability and integrity of these men is beyond question. Undoubtedly the water has improved in the last four years and the last analysis shows it. This is due to the fact that those pipes have been sunk to a lower depth, and have struck a different vein which now flows nearly free from chemical impurities. As to the third question,—Is there danger of contamination through the river or other sources?—several factors must be considered in this connection. First, To what distance will water travel through sand carrying with it its impurities? By carefully conducted experiments it has been proven that this varies from 200 to 2,000 feet, and that in lowering the water in your well you may draw upon the ground water for that distance. The river is certainly less than 200 feet from the well and the surface of the water in the well is often two or three feet lower than the river. Unless the well is constructed so as to prevent the entrance of river water we are certainly in danger of draining its supply through the wet sand into the well. This river is polluted with the daily excreta of 800 families, or of about 4,000 persons, and is not particularly desirable as a beverage.

The only other probable source from whence a poisoned supply of water might be obtained is that region known as "Candfield's Glen." This glen lies about 500 feet from the well in a deep natural basin, bordered with bluffs and cut by ravines which form a natural drainage for the western portion of the second ward. The floor of the glen is interspersed with basins filled with stinking, stagnant water. One of these lies at the extreme east end of the glen about 500 hundred feet from the well. In company with

Mr. McLeod, our city engineer, I investigated this glen. He kindly took the level of the water of the well and of this swamp. He found the water of the swamp 13 feet higher than the surface of the water in the well. That the water from the swamp percolates through to supply the well is of course preposterous. It would probably furnish it water for about an hour, but whether or not this glen and the large area which it drains are the source of that stream of water, which poured into the well when down thirty feet, is another question only to be answered when we know the trend of the stratum beneath the glen. Certainly we want to take no risk of this, and the question is, what protection have we against it. The water company tells us that the water from the pipes down beneath the third impervious stratum, rises in the well to a height three feet above that reached by the profuse surface flow, and that the hydrostatic pressure of this three feet of water would effectually prevent the entrance of water from the upper stratum. Is this true? Let us consider the proposition as stated by these gentlemen. They say that when they had dug their well down thirty feet they "struck a water vein" which entered the well in great volume and with the wonderful fall of six inches to 35 feet, or as one gentleman expressed it: "If you measured the water at the southwest and northeast sides of the well, the bottom of the well being level, you would find the water six inches deeper on the south than on the north side." Leaving this last statement with the student of physics, with whom my informant is on the best of terms, let us follow the water. It rose to some 10 feet in the well but seemed to have direct communication with the river and to pass out readily through its old channel. Assuming that these statements are correct, is it probable that the subterranean water which rises three feet above this upper supply will shut it off and preclude the entrance and commingling of the water from both sources? Is the pressure of three feet of water sufficient to turn the current of a stream running with the force described? If so, what about the time when the water has been pumped to within three or four feet of the bottom of the well, a point lower than that originally reached by the surface water? Suppose that surface water had its origin in Candfield's glen, where the lowest ground is 13 feet above high water in the well, it would find less resistance in flowing out through its old channel to the river than in rising above ten or twelve feet in the well. Yet we would hardly expect to cork it up, or force it to change its old channel by the pressure of fifteen feet of water, supposing its own source to be still thirteen feet the highest. There is no proof that these conditions exist, but they may exist. What evidence have we that the leachings from that ravine that has been the cemetery for dead horses and a catch-basin of filth, may not enter that well?

This brings us to the fourth question: Is the well properly constructed? It is walled up with a twenty inch brick wall laid in water lime. It is surmounted by a substantial but not perfectly water-tight roof. The walls should have been stone instead of brick. Bricks soak water. The walls should have been double, with a solid layer of water lime between each, and a coat of the same upon the inside wall. Walls will crack, but three walls are not likely to all crack in the same place. There are cracks now in that brick wall, and there are places where bricks have fallen out. The bottom of the well should be stoned, the same as the sides, with two layers of stone interlaid with water lime. We would then have as safe a reservoir as can be built underground. It would be safer to have no reservoir, and to pump

directly from the pipes, as the salt wells do, if practicable. To some these precautions may seem superfluous, but where water can leak out, it can soak in, and no one will deny that water can leak out through a fissured wall. As for the connection with the river I have no words for that but those of condemnation. An emergency may arise perhaps, in the vivid imagination of some one, so critical as to necessitate the risk of poisoning a hundred or two of our citizens, but my imagination is not active enough to conceive it. If they can not obtain enough from their well we have Lake Michigan near by, let them draw on that. It is where they should have gone in the first place. It would cost $50,000 or $75,000 probably, but we could all breathe freer and drink deeper if we took our water from thence. No chemical analysis will reveal the typhoid germ. We can judge of its presence or absence only by biological analysis and by the results. About one-third of the number that had the disease used "water-works water." It is impossible to say they drank no other, neither is it positive that those who used their wells did not occasionally drink of the water from the water-works. It is impossible at this late day to fix the blame anywhere, but the fact remains that the city's filth cost her not less than $12,000 and 25 lives. We want no repetition of this; we want to take no risk in the future. To risk may be to die.

Let us next consider the well of C. F. Ruggles. It is situated on the corner of River and Poplar streets, one block east of this hall. A plan of this well hangs before you. Besides the bath rooms which it furnishes with water, this well furnishes a drinking fountain, a horse trough, and a dog trough. Some idea of the importance of this well to the citizens of Manistee will be represented by the following record of the number drinking from it in a single day. On the 16th of July last, 3,019 persons, 343 horses, and 74 dogs drank at this fountain, and 214 vessels were carried from it. This is by no means the most important office of this well owned and built by a private individual.

This water was analyzed last summer by Prof. A. B. Prescott with the following result:—

	Parts Per Million.
Free ammonia	0.03
Albuminoid ammonia	0.05
Total	0.08
Nitrites	0.00
Nitrogen of nitrates	3.(0
Chlorine of chlorides	8.97

The amount of oxygen it contained was very small; hardness, 10°. It gave a faint alkaline reaction, was odorless and tasteless.

You will see that this analysis would make this water suspicious for potable domestic purposes, yet a large number use it without apparent bad effects. Most of us know how much better it tastes than the city water, and this illustrates how little our taste can guide us as to chemical purity. With all the precaution Mr. Ruggles has taken to obtain a pure supply of water, and to protect it from contamination, he has failed, because the water bearing stratum he has reached, tilts upward somewhere to a source of vegetable contamination. This fact should not discourage us from taking the precaution he has employed with such laudable thoroughness, but should rather incite us to redouble our efforts to obtain for this city a public water-supply safe beyond all suspicion.

When I began this paper I thought I would scarcely devote ten minutes to the public water-supply, and that I would have ample time to spend upon the secondary cesspools owned by individuals, but the time has gone and the private well has not been touched. But that time forbids,

"I could a tale unfold whose lightest word would harrow up thy soul."

Through a large portion of our city, water can be obtained at almost any level, and almost every man has a well. I have a block in mind where nine wells and fifteen cesspools are huddled together, the distance between the cesspools and the wells varying from ten to fifty feet. The land is a reclaimed swamp, filled up with sand and sawdust. Water is found at any point, and the wells vary in depth from eight to twenty-five feet. The sawdust pollutes the water and the wet sand offers absolutely no obstacle to the cesspool drainage. Every time a man works his pump handle he drains his own and the neighboring vaults. Each man believes his own well to be perfect, and you cannot persuade him it is not. He has put his money in that well and he proposes to get it out at all hazards. In too many cases the little gravestone in the church yard is evidence that it is hazardous enough, but he sees it not, and drinks on as though he would drown his grief, *similia similibus curantur.*

The private water-supply of some parts of Manistee beggars description. The inhabitants are foreigners, ignorant of all laws of health, and the made lands, bogs covered with sand and sawdust, all tend to make the condition worse than usually found in illy-sewered cities.

I trust that in the near future the water-supply of Manistee will be derived from Lake Michigan. There we can get it pure and plentiful. I hope the city will not long leave this matter in the hands of private enterprise but will own her own water-works; that she will properly sewer every street, condemn every cesspool in the city as a public nuisance and demand its removal.

In conclusion I hope our city fathers will be brought to see that our light, sandy soil furnishes the least possible protection to the entrance of disease germs "which swarm the ground air around leaching cesspools, leaky drains, or the filthy made ground of cities."

The discussion of these questions is to be encouraged, not discouraged. If the history of last year should be repeated it would retard the city's growth, and cost the city far more than a scientific investigation and removal of the cause. To say nothing of the dictates of conscience or honor, a sound business policy demands that we should all strive to ascertain the cause of our past affliction and apply the remedy at whatever cost. Though unpalatable to many, we can not in the light of present evidence pronounce our city water as wholesome, but in view of the fact that its contamination is not impossible, I would, during the prevalence of epidemics, advise the thorough boiling of all water obtained from whatever source we have at present.

DISCUSSION RELATIVE TO WATER-SUPPLY.

Arthur Hazlewood, M. D., Member of the State Board of Health, of Grand Rapids: There are three elements which are essential to life—earth, air, and water. Without air we could only live three minutes, without water, three days, and without food a little over three weeks. Water is a part of our food, and we need about 30 to 100 gallons per day for each individual. In New York and other large cities, each citizen uses 100 gallons per day. In ancient times 300 gallons were considered necessary for each individual to be used in cooking, washing, etc., but this amount might indicate extravagance.

All are familiar with the uses of water-cleansing, food, drink, and the disposal of waste. Any city supplied with water should be supplied with sewers.

In regard to the source of a water-supply, if the supply is from a cistern, it is necessary to know the area of the roof, etc. Rain water or snow water is not pure in itself. It takes micro-organisms from the air as well as the cistern. If cistern water is used, the roofs and cistern should be cleansed at short intervals.

How is well-water likely to become contaminated? Dr. Hazlewood here drew a diagram on the blackboard showing how the well acts as a suction tube for the surrounding soil. In reply to a question, he stated that the old idea that the cone of soakage stretched uniformly only three feet laterally for every one foot in depth was not correct. The amount of soil drained by the well will vary with the porosity of the soil. A well in a soil of gravel or porous sand will drain a much larger area than in a clay soil. You thus see the impossibility of maintaining a cess-pool without contaminating a neighboring well.

Waters are considered as wholesome, suspicious and dangerous. Wholesome waters come from springs and deep wells, surface waters and rivers vary in purity, and the most dangerous of all is the shallow well. As to the removal of these impurities, alum will throw down the suspended matter and make the water clear and palatable, but alum does not destroy the germs. Boiling the water will render it innocuous. In China the water is boiled before drinking, and they do not suffer from cholera. Large filters have very little value as purifiers, because the stratum of sand and gravel soon becomes contaminated and then acts as a source of contamination rather than purification.

A report by the War Department of the physician in charge of the troops in Texas points out the great difference in mortality from malarial fever with different supplies of water. Some of the troops were supplied with surface water and there was a great prevalence of malaral fever. A well was dug down to a lower stratum of water, and the effect was instantaneous in a great falling off of sickness.

The examination of water requires an expert. Water may seem to be pure and not be so. The chemist should be aided by the microscopist and the biologist. The especially objectionable features found by the chemist are chlorine, which points to a probable animal contamination of the water, and nitrites and nitrates which indicate the presence of organic matter, probably of animal origin.

The supply of any city cannot be delegated to individuals. No well is perfectly safe under all circumstances. The necessity therefore arises of finding a suitable supply. Until this is done, all water should be boiled before drinking.

Dr. McPherson, of Manistee, stated that the first year the water-works were established, the water had a disagreeable taste like swamp water, due perhaps to the percolating of the water through the ravine, but an improvement had set in recently. There is reason to believe that typhoid fever may be produced by other causes than a contaminated water-supply. The first typhoid fever in Manistee was contemporaneous with the opening of the sewers. There was no sewerage until five years ago,—no provision for carrying away filth. When the sewers were put in, sawdust, and refuse were dug up and exposed to the heat of the summer sun,—to a temperature of 80 degrees, and the foundation of the contagion was laid.

Dr. Ellis of Manistee said that, with the exception of last summer's typhoid fever, Manistee had been quite exempt from that class of diseases. All should deal fairly with those who supply the city water. They were not guilty of any intentional transgression, they built the well in good faith, and they would be the first to condemn it, if they found it to be contaminated. Several families who used the water had cases of fever, but it did not prove that the water was the source of the contamination. Typhoid fever prevailed without discrimination. Undoubtedly the water company made a mistake in locating the well, because the filth which sinks to the water level must ultimately reach the well. They say the water comes from a southwesterly stream, but we know nothing of the currents underneath. The current of the river is no index of the movement. Still he failed to associate that particular epidemic with the water-supply. Was it not more likely that it came from the milk supply? The germs of typhoid fever abound in the pools where cows drink. Typhoid fever is called a filth disease, but it is as much caused by a microbe as is small-pox. These microbes may occur in the water we drink. In the sick room recently, a woman brought him a glass of water which was red. There are wells in this city of which many people drink, where the water is absolutely red. Such water is an excellent field for the propagation of contagion.

REMARKS ON WATER-SUPPLY, BY J. H. KELLOGG, M. D., MEMBER OF THE STATE BOARD OF HEALTH, BATTLE CREEK.

J. H. Kellogg, M. D., member of the State Board of Health, of Battle Creek, being called upon, said that he would make a few experiments to emphasize the paper which had been read. The contamination of our water-supply is a subject which everybody tries to put out of sight. A man met a boy on the street the other day, and said, "Sambo, what makes you put all the nice peaches on top?" He said, "Mr. Jones, it is for the same reason that you have Milwaukee pressed brick in front of your house while the back yard is chiefly slop barrel." The chart of the back side of a house is too often an arrangement for producing bad water. The importance of a general water-supply can not be overestimated. A paper, copies of which have been distributed at this Convention, was read by Mr. Erwin F. Smith at the Sanitary Convention at Ypsilanti, giving a large number of statistics showing that the death-rate has everywhere diminished with the introduction of a public water-supply.

Water everywhere abounds. The famous witch hazel experiment always works, because you can find water most anywhere if you go down deep enough. This enormous body of water is constantly in motion. Only a small part of the river flows over its bed; by far the greater part is beneath the bed of the river, stretching out on both sides beyond the banks. The ground water flows on slowly, its direction depending on the trend of the stratum, but usually in the direction of the water courses. The filth goes with the ground water the same as with the river. (Dr. Kellogg here drew a diagram of a privy, cess-pool and well, showing how after a rain, the ground water settled, carrying with it the filth of the privy and cess-pool into the well.) As an illustration of the distance which the germs of disease might be carried, Dr. Kellogg referred to the outbreak of typhoid fever in Lausanne, Switzerland, where a whole village became infected from a single case on the opposite side of a mountain. An upland meadow was irrigated with the waters of a brook into which had been thrown the excreta of a typhoid patient. The inhabitants on the other side of the mountain received their water from a spring. Typhoid fever broke out among them. An investigation revealed the fact that the water from the meadow passed through the mountain, and entered the spring. To ascertain whether there was an underground passage through which the water passed, flour was sprinkled in the brook and over the meadow in large quantities, but no trace of flour was found in the spring. Then salt was used, the same as the flour had been, and in a short time the spring on the other side of the mountain became briny with the salt. This showed that the water filtered through the mountain, but that it did not run through by an underground passage, as in that case the flour would have passed through as readily as the salt and fever germ.

An epidemic of over one thousand cases of typhoid fever occurred in Plymouth, Pa., last year, due to the contamination of the water-supply by the discharges of just one typhoid fever patient. In the epidemic through which you have passed was the excreta disinfected? Probably in some cases, but in some cases it was probably neglected. In such a case the whole vault becomes infected and all the surrounding soil is polluted. Your neighbor may have neglected disinfection, he may live three or four houses away, but the trend of the water may be in your direction and if your blood corpuscles are not able to eat up the germs you will get the typhoid fever.

Dr. King did not say much about the private well water supply of Manistee, but what he did say was very pointed and suggestive. It is quite likely that the germs of typhoid fever still exist in your midst. The ground being impregnated with its impurities, the water may absorb them and reproduce the disease. The germ of typhoid lingers, though the disease dies out on the approach of cold weather. The wonder is that more people do not have typhoid fever, but the germs seem to run out. Freezing will not kill them, but alternate freezing and thawing will, and we should be thankful that we live in a climate of alternate freezing and thawing. Boiling the water twenty minutes will destroy these germs. Filtering can not be relied upon because the germs collect in the filter. It is not a complete barrier. As to cows drinking contaminated water and giving typhoid fever, it is a question if cows would not supply a pretty good filter. But this would not be true if the cow contracted the disease. Typhoid fever may be introduced into milk in various ways. Cows are subject to typhoid fever and we don't notice it because it is rarely fatal with them. Cows drink where we don't, and the rules respecting a pure water-supply should apply to animals as well as to man.

As to the testing of water, there are three important tests which anyone can make; first, look at it,—pure water has has no color; second, smell of it after it is shaken up in a can; third, taste it. Pure water is absolutely colorless, odorless and tasteless. What is known as Heisch's test for con-

tamination is very easy to apply. Fill a clean pint bottle three-fourths full with the water to be tested. Dissolve in the water to be tested half a teaspoonful of the purest sugar-rock candy free from threads, or pure loaf or granulated sugar, then cork up the bottle and keep it in a warm place for two days. If the water is then milky or full of little white specks it is bad. If it remains perfectly clear the water is probably safe to use.

Dr. Kellogg next conducted a few experiments before the audience on distilled water and well water. Into each glass he dropped one or two drops of a solution (consisting of three grains of permanganate of potash and 12 grains of caustic potash). In the well water the pink color disappeared, showing the water to be bad. An absolute test can be made only by the chemist and the biologist. A chemical test alone is not sufficient. A good way to prove the presence of the typhoid fever germ in water is by means of the "potato culture." Boil a potato half an hour, pass a sterilized knife through the potato, but do not open it, until ready to place a large bell jar over it when opened. Put a solution of corrosive sublimate around the edges of the jar. By means of a glass rod which has been passed through a flame, put one drop of the suspected water on the potato; if the typhoid germ is present a thin film will be formed of a slightly pearly appearance. A microscope magnifying 500 diameters will show the germ, but the appearance of its mode of growth on the potato culture is believed to be characteristic.

Allusion has been made to the dry season which preceded the outbreak of typhoid fever here last year. There is this relation,—typhoid depending on the fluctuations of the ground water. Dr. Baker has shown that sickness from typhoid fever is inversely proportional to the quantity of water in wells. He shows why this is so in a pamphlet published by the Board, and which any of you can secure by addressing the Secretary.

Second Session, Tuesday, June 5, at 8 P. M.

RELATIONS OF THE PRESS TO SANITATION.

BY APP. M. SMITH OF MANISTEE.

In the consideration of the subject which has been assigned to me for this occasion, I have endeavored to think of it frankly, and accord to the press all the credit that I think it is entitled to, while at the same time I have in my own mind protested against being led into that self adulatory frame of mind, which now-a-days induces many editors, when dealing with their own profession, to indulge in a lot of slush and slop over the great power and the immeasurably good influence which it exerts over the masses of the people.

In making such a frank and unbiased examination of the real existing relation between the press and sanitation, I have been utterly unable to ascertain that the ordinary news or local journal is any more necessarily related to this subject than is the merchant, the mill owner, the lawyer, the manufacturer, or even the cotemporaneous so-called statesman of the day, and heaven knows he is about as thoroughly estranged from this or any other materially important question affecting society, as any one can be. It is hardly necessary for me to inform the shrewd observer of men and matters of the present day, that the press has sadly degenerated from the position (if it ever held it) of a voluntary educator of the public mind, into either a mere channel for the conveyance of news items or else a pitiable and subservient tool for the exclusive use of money getting. That there is anything, however, inherently degrading in the use of the press for the purpose of earning a living for its

conductors, I do not wish of course to assume, any more than I would assume that there was necessarily anything degrading in using the law, the practice of medicine, the selling of goods, or the making of lumber for the same purpose, but I do protest against the assumption that the press so used has any more necessary relation to sanitation, or any other subject of public concern, than has any one of those other callings whose objects are to be generally conceded exclusively selfish.

Such a press, and I maintain that to be the kind of a press we now have, will not, if controlled by conductors of business ability and shrewdness, do any more in a community toward securing good sanitary conditions, than the people themselves would do without its aid; and even that much they will generally neglect or intentionally fail to do until they are forced to by the demand of those who read or patronize their papers. Even then they are exceedingly careful lest some one patron who is to be affected in his business by some proposed change in sanitary conditions, might be offended, and take his advertising and printing to a competitive "print shop." Take for instance the butchering business in our own city as an illustration. We have ordinances against the butchering of cattle inside the city limits, and yet for two years past the practice has been allowed to go on undisturbed within a stone's throw of where you now sit listening to these words, and almost within the sound of my voice. Yea, even some of the luscious veal, porter house steak, or succulent round which you may be called upon to chew unsuccessfully for a half hour, hoping to put it into a proper sanitary condition for the human digestion to-morrow morning at your breakfast table, is most likely bellowing and bleating under the merciless stroke of the butcher's axe at this very moment, within only a block or two of where you now sit. And what is still worse than this, the blood and filth that flows from the death of these animals is allowed to course down the limpid depths of the Manistee river, and mingle with the rotting sawdust and outhouse emptyings to form a delicious compound which may be allowed to ooze into a well only a few feet deeper than the bed of the river and located near its bank, and served up to you at your dinner table as a glass of Manistee's pure, health-giving, sparkling water.

As I have made no special investigation of the subject of our water supply which has been so ably handled by my friend Dr. King, I do not wish to be understood as positively asserting this current opinion about the intermingling of these two elements to be true. I only give to the public a reported condition of things and a condition of things which the public mind believes to be true, and any agitation of which by the press would be heartily endorsed by the people in general. But has the press shown that it bears any relation to this important subject whatever? Not at all. You can find only one instance among the former five (but now only four) journals in this city where the subject has been mentioned. The merchant, the lawyer, the doctor, the laborer and the manufacturer have all, in their individual relations to good sanitary conditions, spoken of the water and its probable impurity to one another upon the street and in the counting room, but alas, that supposed and much-praised watchdog of the public weal, the press of our city, has been almost as silent as the average politician is now-a-days on the prohibition question.

Why has the press thus been silent? The answer is that the relation which the press bears to the editor's pocketbook or means of subsistence, is

so much stronger than the relations which connect it to the public welfare, and as the patronage of the butcher is so very necessary under the present condition of things to the editor's rotundity of body and hilarity of spirits, he deliberately makes up his mind that it is better that the public shall die of bad smells and bad water than that he should die of starvation. And so the water company, which has the exclusive right, under our most outrageous system of making general and widespreading public interests the enforced prey of private corporations, is allowed to furnish such water only to the public as they find it will pay them to furnish. The water may or may not be good, but if good and costly to get, of course they care no more in the prosecution of their money getting business for the public welfare than the editor does, or any other private business; and hence will withdraw or withhold patronage from the editor who dares to insist that they shall furnish such water to the public as will cost more than they think will give a fair profit.

The press, therefore, in order to fulfill what should be its higher mission in relation to these subjects, should everywhere insist that the community should never delegate such powers over the public welfare, as is given to these water companies, to private individuals or associations. Indeed all such general interests that reach out and affect the welfare of the whole people, should be at all times and by all communities reserved within such exclusive control of the community to be affected that they could not by any possible means be sacrificed to or jeopardized by personal greed or private gain. But does the press exercise any salutary influence toward this end? Not at all. They are as dead to it as are the mummies of Egypt. These corporations or private interests have blanks to print, documents to publish, money to spend in securing quiet or suppressing agitation, and the publisher's counting-room stretches its grasping, and in many instances its gaunt and starving fingers out towards the editorial sanctum, warning it that an honest and courageous advocacy of the protection of the public health at the expense of or to the curtailment of the profits of such private interests, means death to the business and hunger and privation to the family of the editor who does it. Don't understand me as meaning to say that these interests directly and corruptly bribe the editors, but they exercise a deterring influence upon them by withdrawing, or not bestowing, their patronage upon those papers that speak out boldly in such a way as will be likely to interfere with their gains.

In a still greater degree also do the organized political parties of the day destroy and annul the relation which the press ought to bear to sanitary reform. Mr. Bill Puffanblowem may be president of a water company, proprietor of a butcher shop, chief manager of a gilded but disease-producing rum hole, owner of a vacant lot with several cesspools of filth on it, or may have on his premises a half dozen dirty hog-pens or out-houses that have never known the touch of a disinfectant, but alas ! he runs the party caucuses, dispenses the public printing and pulls the string that moves the entire political machinery of the community. His nimble fingers mark out just how much of the public funds shall be given out to the publisher of the political organ, and how much shall be allotted from the official salaries to the printing of documents and election tickets. Of course under such a condition of things, the ordinary figure head that masquerades under the name of editor and proprietor of the paper, immediately starts up an agitation of the subject of impure water, tells of the terrible stench that goes out from Bill's butcher shop, recounts the number of young men in the community who have fallen

into the disease of drunkenness through the dreadful malaria of Bill's hell-hole, and comes down like a thousand of brick upon his hog-pens and out-houses that are trickling their pestiferous drippings into neighboring wells, or sending up their loathsome effluvia to be wafted by the evening breezes into the houses of the people throughout the city. Oh yes, we see the editor in imagination, (in a horn, to use a common vulgarism) doing all these things, and showing how nobly the press keeps up its reputation as a conservator of the public health.

"But what are you going to do about it?" says some profoundly logical listener, who fully realizes these great obstacles in the way of the ordinary editor. That is a grave question with a great many, no doubt, but not a very serious one with the writer. In my own case I shall simply speak out, as I hope and trust I have always done, in behalf of the interest of the community, and let the consequences be what they may. "But how can you live?" says an interested friend; to which I answer with the utmost and most implicit faith, that if it be necessary for the good of the human race that I live, no power on earth can kill me, starve me, or in any manner destroy my influence. The power of honest and fitly spoken truth towers above all other agencies known to man, and the still, small voice that lies dormant in the hearts of the people, having been implanted there by the God of ages, always responds and comes to the rescue of the man who nobly answers the voice of his own conscience. Give us such editors whose impulse to write and publish wells up in them from a love of the human race, rather than from the too common impulse of mere money-getting, and then can we point with pride to the power of the press for good among the people, and then the oft repeated phrase that "The pen is mightier than the sword" will become a living reality, rather than an absurd delusion and a roaring farce.

DISCUSSION.

Dr. J. H. Kellogg, of Battle Creek:—I hope that this interesting paper will be discussed. I suppose that people will expect to see in the *Broad Axe* to-morrow the name of that slaughter house. Some one has said that when a man dies of typhoid fever, somebody ought to be hung. The press is the great executioner, and if the press constantly called attention to nuisances, this would be execution enough.

Dr. Richardson, of Reed City:—In a great many families the only educator is the local paper. If editors would ask sanitarians who know about these subjects, to write for their papers, a great deal of good might be done.

Dr. L. S. Ellis, of Manistee:—My experience corroborates that of the writer. The slaughter houses are a violation of city ordinances, and if the health officer attempts to enforce these ordinances he loses his place, and the press will not say a word commending him. Butchering in the city should be abated, for it is a grievous offense against public health.

Rev. J. Snashall:—It seems to me that the newspapers are free to all, and the people, who have complaints, should put in their communications.

Dr. J. H. Kellogg then gave an unwritten address on Ventilation, of which the following is an abstract:

VENTILATION.

A REPORTERS ABSTRACT OF AN UNWRITTEN ADDRESS BY J. H. KELLOGG, M. D., MEMBER OF THE STATE BOARD OF HEALTH, BATTLE CREEK, MICH.

Ventilation is a modern question. It is the air-tight modern house which

requires ventilation; the old-fashioned log cabin ventilated itself. Why do we need to ventilate?

We need a constant change of air, not so much for the sake of the oxygen used up within the body, as to take the place of the air which we have rendered impure. We not only render the air impure by contaminating it with carbonic acid gas, but, what is more important, a large amount of poisonous matter is constantly escaping from our lungs and bodies. (The speaker here illustrated how the air is rendered impure, by breathing in a jar, thus causing a lighted candle to be extinguished, also by breathing in a glass of lime water, causing a sediment in it.) But it is not our breathing alone which contaminates the air in which we live. There is continuously arising from our bodies an atmosphere of poisonous matter. If this matter were visible each human being would be seen to be surrounded by an atmosphere of impurities.

How much pure air do we need to take the place of the air which we have spoiled? It is hardly possible to get air too good, but to keep it pure enough for practical purposes we need two cubic feet or one-half barrel for every time we breathe. The amount of air we spoil is of far greater consequence than the amount we actually need for breathing. How are we to get this half barrel for every time we breathe. The popular idea is that ventilation is all a haphazzard thing. This is an error. Ventilation rests on as scientific a basis as geometry or any other branch of mathematics, and its principles are easily understood.

The first principle of correct ventilation is that we must have two openings, one for the fresh air to go in, and one for the foul air to go out. (The speaker here performed an experiment with a miniature house, showing that it was impossible to force smoke into the house because the house was full of air and there was no place for this air to go out.) Still there must be something else besides two openings. The openings must be so related as to produce a draft. We must have a ventilating flue, but the flue has no intrinsic tendency to draw, it must be heated. So long as this shaft is kept heated we will have a constant flow of foul air through it into the outer air. If not heated, cold air may come down it instead. I was examining a church recently and the janitor told me that the ventilating shaft was the fresh air inlet, and it was, because there had never been any heat in it. It is immaterial how the shaft is heated, by a steam pipe, lamp, or burning coal, or the shaft may be in the center of the building and heated by the warmth of the house.

Where shall the air be taken in and out, at the top or bottom of the room? This depends on the kind of air taken in. Suppose the fresh air is taken in cold; being heavier than warm air, it falls to the bottom of the room. The warm air rises to the top and gets more and more impure. If fresh air is taken in hot, it goes at once to the ceiling, and when it gets down to the floor it is most impure. So the opening for exit of foul air depends on the kind of air we take in. In cold weather if the fresh air is warmed, the floor is the best place for a fresh-air inlet on the whole, and in taking air out, not to be robbed of our warm fresh air, it should not be taken out at the top of the room.

How would we undertake to ventilate an ordinary house? It need not cost much. Putting in a flue simply takes out brick, that is all. How large a shaft shall we have? That depends upon how many people are to occupy

the room. If each person requires two cubic feet of air every time he breathes, he will require forty cubic feet a minute, because we breathe about twenty times a minute. This would make 2,400 cubic feet an hour for each individual. Suppose we estimate that each individual needs 2,000 cubic feet of air per hour, or 30 cubic feet per minute, or one-half foot a second; and the problem is, how large a hole will it take to pass through one-half foot of air a second, if it is moving at the rate of a foot a second? Naturally, an opening of one-half foot. If it is moving five feet a second, then one-tenth of a foot for each person, or one foot square for ten persons. How much space would be required for a church? If it holds one hundred persons, it would need a ventilating shaft one foot by ten feet. Only a few buildings are ventilated that way. If the building holds one thousand persons, forty openings two and a half feet square would be required.

How large must the shaft be? This depends on the degree of heating and the hight of the shaft. It may be stated as a rule that if you multiply the square root of the hight of the shaft by the square root of the difference between the temperature of the air outside and inside and then divide by four, this will give the rate of movement of air per second. Suppose the shaft is fifty feet high, the square root of this is seven, suppose the difference between the out-door temperature and the in-door temperature is 36 degrees, the square root of this is 6. Multiplying these square roots and dividing by four we find the air will be moving at a rate of 10 feet per second. Knowing the rate at which air is spoiled by breathing, the number of cubic feet of air contaminated in a given time, knowing the rate of movement of the air at any given time and place, it is easy to calculate for any room the proper size of the foul-air openings. Because air is cooled by the window down which cold air flows; the best place for the registers is underneath the windows, opening into ducts connected with the ventilating shaft.

The speaker here performed an experiment with a miniature house in which rooms both up stairs and down were ventilated by one shaft. When the house was shut tight there was no trouble, but when the window up stairs is opened the current (illustrated by a current of smoke) goes through the room up stairs, because opening the window creates a strong draft out. This is what happens when rooms in two stories are ventilated by the same shaft. The second story is apt to act as a foul-air ventilator for the first.

I cannot estimate too much the necessity of good ventilation. The frog gets along without much air, it gets used to its conditions, once in a while coming up to take a swallow of air. The humming bird, on the other hand, has not sufficient room for air in its lungs and has holes in its bones for air. The frog is cold and sluggish, while in the humming bird the temperature is over 100 degrees. So with men; if we breathe bad air, if we have not a good supply of fresh air, we may become accustomed to it, but we lead a sluggish life.

Third Session—June 6, at 10:00 A. M.

HYGIENE OF BATHS AND BATHING.

Rev. A. Walkley of Manistee, gave a short account of the workings of the "Emeline Bath Co.," in substance as follows:

Believing that a clean body was necessary to a healthy body, an association which afterwards became the Emeline Bath Co. began its work by building a bath room and offering its free use to the employés of a certain lumber firm in Manistee. The results being excellent, a company was formed in 1885, and twelve new bath rooms were fitted up and opened to the public of Manistee. Associations to promote the work of this company have been established in Chicago and in Manistee.

It is not the intention of the bath company to ever furnish baths absolutely free, because it believes that it is wrong to lower men by making them objects of charity. No officers or members of the company are to receive a salary, and the books of the company are always open to public inspection. The price of these baths has been placed at the low figure of 10 cents for a tub bath, and 5 cents for a shower bath. When the patron brings his towels a deduction of two cents is made. The work at Manistee began on the 8th day of August, 1885, that being the day on which the first bath was given. During the first year the company gave at Manistee 11,528 baths, for which the total receipts were $645.46. The running expenses for the first year ending August 7, 1886, were $856.78. This does not include rent or any part of the cost of establishing the plant; both of these being donated to the undertaking; but it does include the wear and tear on the towels, shampoo bottles, combs and brushes. The shortage on the first year was $211.32.

During the second year ending August 7, 1887, the number of baths given was 14,081 and the total receipts for that year were $1,009.32. The running expenses reckoned in the same manner as in the first year were $1,055.68, making a shortage on the second year of $45.77.

The cost of baths given at Manistee the first year was 7 and 43-100 cents, the amount received was 5 and 59-100 cents. The second year the cost was 7 and 49-100 cents, and the amount received was 7 and 17-100 cents. It will be seen from this that the good work is progressing. Yet the facilities at Manistee would have permitted the giving of 298,892 baths had all the time during which the rooms were open been occupied by patrons. The number of baths actually given was 25,609, the difference being 267,283. The number of baths that at a nominal additional cost, could have been given had the house been patronized to its full extent is 702,260.

The bath house is open every evening except Friday, from 7 to 9 o'clock, P. M., all day Saturday from 7 A. M. to 9 P. M., and on Sunday from 7 A. M. to 12 M. for men and boys. On Fridays it is open from 2 to 9 P. M., for women and children. The hours are sufficient to supply the demand.

A bath house was established in Chicago under an act of the General Assembly providing for the organization of companies to do charitable work. Yet it is astonishing, the amount of work and trouble that was necessary in

order to establish the baths in Chicago. During the first year 44,474 baths were given in Chicago, yet with the same facilities there could have been given 375,232 baths with only a little addition to the expense. During the first year the baths were in operation in Chicago, there was a shortage of $1,818.25.

The experience of all reforms confirms the advice that in order to completely carry out a reform we must begin with the children. Acting upon this, the Emeline Bath Co. aims at getting as many children to take regular baths as possible. And it was thought that the best way to do this was to interest the teachers of the common schools. The superintendent of the schools at Manistee thought that the best course to pursue would be to raise a fund by subscription for the purpose of giving all the scholars free baths. Such a fund was in time raised, and tickets prepared to enable the teacher to give orders upon the bath house. The ticket must be used for the time for which it is issued or it is canceled. Prof. Jennings, superintendent of the Manistee city schools, says that "The project has been a great success in every respect, the children are delighted with it, and I believe are greatly benefited. I have heard of no instance where injury has resulted. The teachers are especially interested in the plan and heartily approve of it. In many of the lower grades particularly, the experience of the teachers has been that the effect of the bathing is actually perceptible in the improvement of the atmosphere in the schools."

It is no particular help to a laborer who earns one dollar a day to furnish him with a bath at 5 or 10 cents, for which at other places he would pay 25 cents, if at the same time you keep him waiting hours before you can furnish him with a room in which to take his bath. In order that such a man, who is a regular patron of our bath house, may be waited upon immediately upon his entrance, tickets have been issued similar to the plan of reserved seats in a theatre. A ticket reads thus when filled out: "This ticket entitles the purchaser, but no other person, to the use of bath No. 1 from 1 o'clock p. m. to 1.20 p. m. on the first day of the calendar month in which the same was purchased, but at no other time. Not transferable. Void and to be surrendered if not used at the above time. Emeline's Bath Co." These tickets sell the use of a particular room for twenty minutes of any half hour, and are on sale for thirty days in advance. Thus, if a person wishes to secure bathing facilities for Saturday of each week at any particular time during the day, he can purchase a ticket covering the particular half hour on which he wishes to bathe for thirty days in advance, and his room will be reserved for him at that time for each of the Saturdays for which he holds tickets. But, if for any reason the holder should find that he is not going to be able to take his bath at the time for which he has purchased his ticket or tickets, he can, by presenting them at any time before the time has expired for which they called for a bath, have his money refunded. This ticket states that the original purchaser but no other person can use it, also that it is not transferable. The object of these provisions is, that, should there come a time when the full capacity of these rooms is required, no person can purchase tickets for all of the rooms and sell them at an advance of the price asked by the company, but the Bath Company will honor tickets, though they know they were not purchased by the person presenting them, and would allow of such a transfer of tickets so long as they were not made a source of profit to the purchaser.

Though these tickets call for only twenty minutes' use of the bath room and

notwithstanding that that is the time allowed to all bathers to bathe, yet if the rooms are not required, a bather may occupy all the time he wishes.

Tickets are also issued to be used by those engaged in charitable work. The hour of the ticket is always named, and if not presented at that time it will not be honored. The reason for this strictness is to prevent the selling of the tickets or the trading of them for liquor.

While the Emeline Bath Co. furnishes tub baths for those who desire them, it heartily recommends the shower bath for the following reasons:—

(1) In cases where one bather follows immediately after another the atmosphere of the shower rooms is the purest, as the spray from the shower absorbs the impurities of the air and carries them into the sewer on the same principle that the rain purifies the air outside.

(2.) The patron of the shower bath does not come in contact with anything that the former occupant came in contact with, except the rack which he stands upon and the seat which he sits upon. This seat is varnished with shellac, and may be showered by the occupant.

(3.) The water of the shower bath is continually changing, so that the bather is using fresh water to every part of the body.

(4.) The occupant of the shower room has easy access to all parts of the body, owing to the upright or sitting posture, while the occupant of the tub can reach only one-half of his body at a time, being obliged to turn in the tub to reach the other side.

(5.) The occupant of the shower has no resistance of water-pressure to contend with, while in the tub bath the feet and that portion of the body resting upon the bottom of the tub are under the pressure of nearly one-half pound to the square inch, which of course to a certain extent resists the throwing out process of the pores. The Emeline Bath Company does not recommend the use of soap. Instead, a quarter of an ounce of salts of tartar and a quarter of an ounce of borax to one quart of water is found to produce an alkaline sufficiently strong to cut the oil of the body, and at the same time the borax is found to have a cooling effect on the skin.

DISCUSSION.

Hon. T. J. Ramsdell then made some remarks concerning this subject, and expressed the hope that doctors would investigate and encourage the Emeline baths.

D. A. McLeod, C. E., of Manistee, then read the following paper on "Disposal of Waste in Manistee by Sewerage and Otherwise:"

DISPOSAL OF WASTE IN MANISTEE, BY SEWERAGE AND OTHERWISE.

BY D. A. MCLEOD, C. E., OF MANISTEE.

The subject which has been assigned to me is a subject of much importance, and has received considerable attention from all civilized nations.

We read that even in the earlier ages, some attention was given to it, but I must necessarily touch briefly the different ways suited to Manistee; and I feel unable to do anything like justice to the subject in so short a paper,—in fact it seems a good deal like walking around a ring to find the end.

An examination into the sanitary condition of a large part of our city will

show the great need of some kind of disposal of waste, for in many parts no measures have ever been taken to do away with the accumulation of impure matter incident to a large population. Year after year, the waste, which should have been removed far from our dwellings, has been thrown upon the surface of the ground or into cesspools or vaults, where the filthy mass has been left to poison the atmosphere; the earth upon which many of the houses stand is saturated with sewage, and there the occupants live in the reeking filth of past years, inhaling contaminated air and drinking water from a polluted soil. We are thus constantly reminded of the need of some remedy. The remedy should be strenuously applied and the result would be far more healthful and less expensive than the inevitable results of present conditions.

This subject is one of vast importance, from a sanitary point of view, to the human family, yet in all its details, it is not a pleasant subject to consider. Waste suggests decay, and consequently is offensive, but it is injurious to the public health, and should receive the proper attention of this convention, and some of the best methods and systems in use in this and other countries, for the disposal of waste, should be considered. Of all the sciences we cultivate, there is none of *higher* importance to the prosperity and happiness of a nation than the science of public health, which lies at the very root of all good government.

The refuse of the kitchen and table should be burned in the stove immediately and not left to accumulate, where it cannot be used for feeding purposes. It would surprise one not in the habit of disposing of waste in this manner to see how easily it is thus disposed of. Waste matter should never be left in pails or barrels to decay. Houses and yards are often allowed to become filthy and unhealthful, by the accumulation of chips and decomposing vegetable and meat scraps, the latter often being found in cellars. Streets and alleys should be properly cleaned, so as to prevent the formation of noxious gases. But the great source of evil is the privy vault, which has robbed many a family of some member very dear to them. How often in our ignorance we say that Divine Providence has seen fit to remove our loved ones, when it simply is the penalty paid for violating sanitary laws.

Wherever we find a city, or part of a city in an unsanitary condition, there we also find the typhoid fever, diphtheria, cholera, and other forms of disease. We know that many cities, visited year after year by epidemics before proper sewerage was introduced, have become healthful after the introduction and maintenance of sanitary sewerage.

Cesspools and vaults are especially dangerous, because of the manner in which they are made. In many cases refuse is deposited in them to be in turn drawn out of the wells; hence, if they are used at all, they should be water tight and thoroughly cleaned once a week. But the question arises, how can we do without the convenient death traps until we get sewers? I would advise the use of the dry earth or pail system which, if properly managed with police regulations, is far better than the cesspool or vault. Let the vaults and cesspools be thoroughly cleaned and filled up, then erect an ordinary building, under the seat of which dig out a concave surface, as long and wide as the seat, and about twelve inches deep, plaster this with a heavy coat of good cement such as is used in plastering cisterns, have a quantity of dry earth or ashes constantly on hand, so that some may be thrown into the closet two or three times a day, clean once a week, and remove the contents to gardens or farming lands. This plan can be carried out with little cost,

and, if thoroughly done, deodorizes and, to a certain extent, disinfects the excreta. This system should be inforced by the Local Board of Health until our city is completely sewered, as it is far better and safer than our midden death traps. Still it has not been shown that the mass has been disinfected as well as deodorized. It has been said that the true key to sanitary progress in cities is good water-supply and sewerage. No city can be purified by mere hand labor. As civilization has advanced, people have always enlisted natural forces or machinery to do away with hand labor, as being less costly and more efficient. We will note briefly some of the results obtained by the water carriage system.

It is very essential that all offensive household waste and all excrement be removed from the vicinity of our homes as thoroughly and immediately as possible, and in such a manner as to give the least evidence of its presence. These results are best obtained by receiving and removing all waste in a deodorizing medium. It is conceded that removal by the water carriage system more nearly meets these requirements than any other system yet in use, as it is immediate, complete, inoffensive, and practically automatic, not depending upon the manual labor and care, or want of care, of the average servant, and being applied by our best engineers.

Sewers from the nature of their use, must be in some degree foul, and in order to be convenient, must be connected with the interior of our buildings, at the same time acting as surface, subsoil, and cellar drains, all of which the combined system is intended to do; but where a sewer does the work of a common drain, it is at the same time a distributing pipe, its contents polluting the soil along its entire length, for such pollution has been traced by the analysis of water drawn from neighboring wells. Such conduits should not be called sewers but drains, and should not be used as sewers in any case. Sewers and drains were formerly devised with the single object of making them large enough, by which it was supposed that their efficiency was secured, but sluggishness of action is now recognized as the certain consequence of excess of surface, as well as of deficiency of fall. A small stream of liquid matter extended over a wide surface, and reduced in depth in the proportion to the width, suffers retardation from this circumstance, as well as from want of fall in the current. Hence a sewer which is disproportionately large, in comparison with the amount of drainage, becomes an inoperative apparatus by reason of its undue dimensions, while, if the same amount of drainage is concentrated within a more limited channel, a greater rapidity is produced, and any addition to the contents of the sewer aids, by the full force of its gravity, in propelling the entire quantity forward to the point of discharge. It is remarkable that the practice of making drains and sewers as large as possible, instead of as small as necessary for efficient work, should have continued as long as it has; the only reason must have been the thought that a drain must fill up in time, and consequently the larger they were made the longer it would take it to choke up, and the less cleaning would be necessary. On the contrary, the smaller the pipe the less friction; and the greater the hydraulic pressure, the greater the velocity and consequently the less chance there is of any obstruction taking place.

You have observed by this time that there are two or more branches of the water carriage system, the combined and the separate. The great expense of the combined system and the difficulty of keeping the sewers clean, have led to the experiment of building small sewers to carry away only waste and

excrement (which are properly called sewage) and disposing of the storm and surface water by gutters and short drains leading to the nearest natural water course; this is known as the separate system.

The sewage of a city is nearly a constant quantity. It is approximately measured by the amount of water used daily in houses and factories, consequently it is easy to adopt the size to a steady flow, and make it self-cleansing. On the contrary the combined system would need to be large enough to carry the rain-fall, which is variable in quantity, and the sewage proper would be a trickling stream at all times, except in times of storms, and would inevitably result in putrefaction and the generation of sewer gas without the means of cleaning except by hand labor. The object of the separate system is the complete removal of sewage proper from cities in such a manner as shall best serve the convenience, economy and health of the people. We must have constant and rapid flow of the sewage, thorough flushing, and good ventilation. All sewers, whether of the combined or separate system, should be flushed every day in order to meet the end sought. Automatic flushing tanks should be constructed at all dead ends.

O. W. Wight, A. M. M., D., health officer, Detroit, Mich., in his annual report to the common council, says in regard to the combined system: "With the clumsy, costly, perilous combined system in general use for removing water and sewage together, the earth of towns gradually becomes infected with organic matter in a state of putrescence. Hence the water of springs and wells at length becomes polluted and unfit for use. With a separate, properly constructed and properly managed system of impervious pipes for the removal of all sewage, and with other sound sanitary regulations for the care and removal of solid organic refuse, there is no reason why the spring water and well water in towns should not remain clean and wholesome. Besides, when the earth of inhabited places is kept so clean as to preserve the purity of the water, no exhalations will arise from it deleterious to health and dangerous to life.

"This is not the place to describe in detail the separate sewer systems for the removal of liquid organic wastes from inhabited places. The engineer must conform to the requirements of sanitary science. Any system will be faulty which allows sewage to putrefy at all, either in its source, on its journey from human abodes, or in its outfall. * * * * The great principle to be kept in view is the removal of sewage (not sewage diluted with vast quantities of surface and subsoil water) without pollution of the soil, without putrefaction, and consequently without sewer gas on the journey. * * * * The soil where man dwells is sacred, and it is sanitary sacrilege to pollute it. He who fouls the air that he breathes himself, or the water that he drinks, or the food that he eats, is a barbarian who might learn wisdom from the cat or decency from any swine not demoralized by contact with man. He who fouls the air that another must breathe, or the food that another must eat, or the water that he must drink, is a criminal to be classed with those who maim and kill.

"There are more reasons for such care in the removal of wastes from inhabited places than appear on the surface. The chemistry and hygiene of putrefaction are complex, involving many practical considerations. Wherever there is a collection of putrefying organic matter, whether on the ground, in the ground, within a faulty sewer, or under a habitation, there is a tireless foe to health and life. Not only are putrescent collections of garbage, decay-

ing vegetables, manure, offal, and human excreta, harmful in themselves, by reason of exhalations, poisoning the air and leaching liquids, polluting the earth; they are also depositories and multipliers of disease germs. Such collections may not produce infectious diseases de novo, but they lessen the vitality of people living in the neighborhood, and they thereby lessen the power of resisting epidemics. It is a well known pathological fact that nature struggles to eliminate disease by excretory processes. Accumulations of filth containing excreta, may, therefore, harbor seeds of various communicable maladies. Sewer gas, while it may not beget scarlatina, diphtheria, small-pox and other contagious diseases, easily becomes the vehicle of conveying them, through obscure and intricate channels. * * * A foul sewer, swarming with scarlatina germs, may be more dangerous to a neighborhood than an infected school-house."

For Manistee I would recommend the separate system of sewerage for the low, flat grounds for several reasons. First, the fall is so small that it would be impossible to keep the large combined sewers in good working order, as they could not be flushed, and the clearing would have to be done by hand labor, and at such long intervals that the sewers would become foul and offensive. On the other hand, a line of small pipe could be built to the proper outfall, for the purpose of carrying off the sewage and first wash of the streets, as the first wash of the streets is often as foul as sewage. Such a sewer could be flushed and kept clean with a very little care if properly constructed, short drains could be built to carry the storm and surface water to the nearest water course or body of water, and both could be constructed for less money than would be required for the combined system. For the higher parts of the city, I would recommend a system of sewers a little larger than the separate system, such as we now have, on account of the great fall attainable. The large amount of water would flow very rapidly through the small sewers, and there would be very little chance for it to choke up, and with automatic flushing tanks it could be kept clean at all times.

Ventilation is of great importance to the proper workings of a sewer, and many devices have been proposed. Some have advocated high chimneys with a fire in them to produce a draft; others, a shaft with a screw or fan for producing a current, and some have advocated open manholes with filters. None of these plans have proved satisfactory, and there seems to be no way of disposing of the gas except to have the man-holes, lamp-holes and flushing tanks with perforated covers, and to carry the soil pipe, the full size, untrapped on the outside of the house, above the roof away from chimney shafts or windows or any other opening, and have all connections securely trapped so that no gas can possibly get into the house. The practice of making unventilated sewers is very dangerous, as the gas in such a concentrated form must escape somewhere, and, of course, will force small house traps, which would not happen if the sewer was well ventilated, because the street openings (viz., man-holes, catch basins, etc.) would act as fresh air inlets and the soil pipe, carried above the roof, would act as an outlet.

Says Dr. Carpenter, in the Journal of the Society of Arts: "If a sewer flushes clean as it ought to do, if it does not become the habitat of sewerage confervoid growths upon its inverts; that is, if it is regularly scoured above as well as below the line at which the sewage ordinarily runs; if there is nothing to intercept the passage of sewage from its origin to the point of its departure at the outlet, then there will be no sewer gas, there will be no stink, there will be no danger to anybody."

The openings on the inverts of the arch of the street sewers will be inlets for fresh air, and the ventilators, produced by the extension of the soil pipe of every water-closet above the level of the house top, will be outlets for the air which has passed through the sewer. Thus a constant circulation will be promoted at all times by the ordinary laws which belong to gases, and which by their very nature prohibit stagnation in fluids of all kinds. Occasionally there may be down draughts, but they will be of no more moment than the down draughts through an ordinary chimney—indeed they will be as infrequent as a down draught into a furnace when the fire is low. Fresh sewage is not dangerous to anybody, but if it is kept within the curtilage of the dwelling house by means of interceptors, or if it be allowed to stagnate in a badly constructed sewer until fermentative changes have arisen within its substance, it then produces the chance of evil; but in the present day no authority ought to be allowed to keep sewage within its borders until such a change has taken place. It should be "moved on" out of range as rapidly as possible.

All sewers should be constructed with a view to cleanliness. We have found that all human experience has shown proper and efficient removal of sewage to lie unquestionably at the very foundation of all sanitary improvements, and at the same time to prevent in a great measure moral degradation, proving thereby the truth of the scriptural axiom that "Cleanliness is next to Godliness."

DISCUSSION RELATIVE TO SEWERAGE.

Dr. E. L. Shurly, of Detroit: This is a subject of interest. Sewers should be ventilated, because changes in pressure are constantly going on in the gases which they contain. At any moment there is a possibility of sudden expansion. When hot water is poured into the sewers it may produce a miniature explosion. The fact that the sewer is trapped is not positive assurance of safety, because these small explosions may drive the gas up through traps into our houses. By pressure of water sewer gas is forced up into the houses in the city of Detroit. Some of these gases which come from the sewer are the insignia of putrefaction. Small sewers are not so dangerous as larger ones, for they do not furnish so much space for the substances to collect. Sewers planned and made in modern times should carry away the sewage before it has time to putrefy; but ventilation is useful even in the best of sewers.

Dr. Henry B. Baker, Secretary of the State Board of Health, of Lansing: An outbreak of typhoid fever at the State Industrial Home for Girls, at Adrian, last winter, was caused by the air-supply becoming contaminated by sewer gas which probably contained the specific germs of typhoid fever. The discharges of a typhoid fever patient had been first thrown into the sewer. A rain-water conductor used as a ventilator had filled up with ice during the cold weather, and there was no ventilation for the sewer. The fresh-air inlet was closed as it should not have been, and they took their supply of air from the basement. The gases could go no other way than up into the house. An outbreak of typhoid fever resulted.

The paper read by Mr. McLeod is a good one, and should be studied at leisure by the citizens of Manistee.

Dr. Robinson, of Manistee:—I have but little to say upon this subject. The disposal of waste and the obtaining of a pure water-supply, are two of the most important problems of a city's sanitation. The care we should take to remove our waste is only second to the necessity of pure water-supply. The vault system is a source of great danger, and should be abolished by the substitution of proper sewerage.

Dr. J. A. King, of Manistee:—I have nothing to say on the subject of sewerage, but I will take this opportunity of answering some objections made to my paper on the kindred subject of water-supply. I did not condemn the water-works. No one could justly do so, unless he had conclusive evidence. That evidence can not now be produced. A biologist might have shown the cause of typhoid fever six months ago. It is too late now. The same objection applies to the assertion that old stumps and decaying vegetable matter cause the fever. No evidence is produced, and the conclusion, based on

mere opinion, proves nothing. Malaria may be caused this way, but not typhoid fever. Cases of milk contamination have occurred, but in another way than that mentioned, usually through the contamination of the water used to rinse the cans, etc. As to the possibility of the water-supply being contaminated by surface water, the stockholders claim that their subterranean supply is three feet above that ever attained by the surface water in the well, and that this is sufficient to shut off the entrance of surface water; but it must be remembered that three feet of water exert a pressure of only a pound and a half to the square inch. The fact that other epidemics have been traced to drinking water, is presumptive evidence in favor of the water having caused the epidemic here. In Munich, Germany, before the introduction of sewerage and water-supply, in the years 1851-1859, the death-rate from typhoid fever was 16.8 per every 10,000 inhabitants. This was reduced in 1860-1865, to 18.6, and to-day with a good sewerage and water-supply, the death-rate is only about 3 per 10,000. In this respect the history of Munich is the history of every other city before and after the introduction of a good water-supply.

Fourth Session, Wednesday, June 6, at 2 P. M.

CAUSES AND PREVENTION OF PULMONARY CONSUMPTION.

BY PROF. E. L. SHURLY, M. D., OF DETROIT.

It is not surprising that a disease so prevalent and fatal as pulmonary consumption, should have enlisted so much earnest thought and observation from both the professional and lay mind. When we recollect that it is estimated that about fifteen per cent. of all deaths in the United States are from this disease, we see that it strikes every community and almost every family sooner or later; nothing, therefore, is more fitting than that we should "reason together" concerning its causes and prevention. As the time and scope of this paper will allow of no detail or classification, I shall proceed at once to call attention briefly to the several alleged causes.

The progress and research of medical science has kept our knowledge of its pathogenesis, or minute development, in a very unstable state, and to-day we are wrestling with the theory of its micro-biotic origin and development, and, although we may not yet have arrived at the deep hidden retreats of its beginnings, we are certainly on the confines of such district.

Were it settled that the bacillus (which is so constantly identified with so many cases of pulmonary consumption) is the origin and cause of the disease, our task would be well nigh accomplished so far as the cause and prevention of the disease is concerned; but, alas, daily observation and experience show us that there is much more information yet to be obtained from nature before we reach a perfect understanding of the life history of this microbe and its real relation to the general disease under consideration. It is advocated by many competent ones in our profession that the presence and growth of the *bacillus tuberculosis* is the real cause of consumption; that it is introduced into the system through the food or air—being in the milk or flesh of infected animals which have been eaten, and disseminated in the air all about us from the dried sputum of those who are suffering from the disease, thus constantly endangering all of us; and besides, that these germs are transmitted in a latent state to the offspring of the race. Furthermore it is

asserted, that, when by accident any human economy becomes physically reduced, or possessed of a peculiar inherent quality of physical constitution called tendency, these germs or microbes find a favorable soil, so to speak, and at once develop or propagate, producing the disease, pulmonary consumption; but that, owing to their low vitality or weakness, a healthy body, or at least a body devoid of the proper tendency, is able successfully to resist the development of the microbes so that they perish, are cast off, and the disease does not follow their incursion.

This beautiful theory effectually does away with the doctrine of heredity and natural immunity in this respect. Now, while numerous experiments upon guinea pigs and other of the lower animals, together with many clinical reports in its favor, would seem to lend great support to the theory; yet the great mass of facts garnered from the clinical experience of the civilized world seems, up to the present time, to show that there are a large number of persons who enjoy a natural immunity to such an extent that, however reduced or perverted physically, they can not, or rather do not, under the most favorable opportunity for contagion, contract the disease, notwithstanding even association with the active forms of the malady where we may suppose the germs to be in the greatest state of activity; while another class, however protected hygienically, do, by families as it were, sooner or later fall victims to the disease. This is well illustrated in the consumption hospitals of Europe, where attendants live for a number of years in intimate association with the disease, without ever contracting it.

Therefore, if the contagion is so feeble as to only exceptionally inoculate surrounding persons, we can under such circumstances be hardly justified in regarding consumption as a truly contagious malady; although discretion would always dictate that healthy persons ought to be prevented from a too constant contact with persons suffering from this, or in fact, any other disease, especially relatives who are obviously mentally depressed by anxiety. Regarding the possibility of infection from the lower animals, I may say that the tuberculosis in them is probably not strictly identical with the human disease, and, if it were, the latent germs of the bovine disease, resident either in the flesh or milk, would be readily destroyed in the human stomach by the process of digestion.

I am sorry the time will not permit of a more elaborate discussion of the micro-biotic and contagious character of the disease, for it is one of the most active, scientific questions of the day, and too much thought and observation cannot be given to it.

But we must proceed now to consider another of the alleged essential causes, viz., heredity. Heredity, upon the theory just mentioned, is accounted for by the actual transmission of the specific germs in a latent state from parent to offspring; but from the older and more practical view it is defined as a particular individual physical stamp covering the whole range of nutrition and development. It is even denied by some as a contributing factor in pulmonary consumption, and the family fallibility entirely attributed to modes of life, contagion and other surrounding circumstances. However this may be, the inexplicable fact remains that heredity is found to be a part of the clinical history in about thirty per cent of the cases recorded in the civilized world. That association, occupation, contagion, etc., fail to adequately explain away this terrible family allotment of the disease through heredity, appears from the fact that members of such a family may be separated for

years, living in widely different countries, leading widely different lives, and attaining a very good standard of health, and yet one after another melt away "as snow before the sun" before the ravages of the disease; some of them, perhaps, without any apparent exciting cause. The law of atavism operates here often curiously. I know of instances where four or five children enjoying salubrious surroundings and whose parents, uncles and aunts were healthy, have succumbed, one after another, upon reaching the ages of eighteen to twenty-five, or thereabouts, to tubercular consumption of one form or another; some of them being pictures of health and vigour, whose taint was discovered to have descended from the second or third generation before. One family in particular I call to mind in which the patient's paternal great grandfather and all his family, excepting one, had died of pulmonary consumption; the disease never showing itself again until his generation, when he and his two sisters and one brother fell victims. It is very evident, from our present state of knowledge, that heredity does play a very important part in the production of pulmonary consumption; and there seems but one method of eradicating this element, a method, however, which is impracticable because dealing with man's most inner sentimental nature; that is the regulation of marriage. I am well aware that law, so called, will not reach the evil of bad marriages physically speaking, but we may hope that communities may in time become so educated in sanitary matters and requirements as to give a little thought to the physical attributes of posterity and the creation of a pure blooded nation, instead of an intellectual or wealthy one. We frequently have knowledge of connubial selections which are monstrous, and when we think of the possible issue of such marriages we are appalled. But no amount of advice or exposition of natural law or fact will prevent the consummation of such a union in the majority of instances. I am happy to say, however, that I have met with a few stronger minded persons who have allowed reason to subjugate impulse and sentiment in this particular.

In this connection also I would call attention to the predisposition to pulmonary consumption entailed through the inheritance of physical taints acquired by the transgressions and luxuries of parents, whose attention perhaps has not been sufficiently called to that grand admonition of the Decalogue, viz., the sins of the fathers shall be visited upon the children unto the third and fourth generation.

The next most imposing element of causation is the contraction and imperfect recovery from the acute non-tuberculous diseases of the lungs, such as pneumonia, pleurisy, bronchitis, etc. These diseases, although as a rule self-limited, with a tendency always towards recovery, may be so deflected or prolonged in their course, by untoward individual or surrounding circumstances, as to lay the foundation and beginning of pulmonary consumption; this is especially true with persons possessing a natural predisposition or those who are or have been dissipated, or are placed in bad hygienic surroundings.

Nasal catarrh, which people have been led so to fear by unscrupulous advertising chaps, is not especially liable to induce this disease; it is more inclined to remain localized in the nasal passages.

Occupation requiring close confinement in badly ventilated, damp, or overheated shops, offices or rooms, or the respiration of air loaded with smoke or solid particles, or requiring constant sedentary and constrained positions of the body, is a prolific exciting cause of the disease. As a rule indoor occupations give a much larger percentage of mortalities than outdoor occupations.

Personal habits, such as the abuse of alcoholic beverages and tobacco, excessive worry, excessive mental work and luxury and too little sleep, are striking exciting causes in many cases; quite a number of young men fall victims in this way by too often overdrawing on the physical banker, as for instance attending to their work or business through the day after "going around with the boys," as they say, during the evening and night, thus losing necessary sleep. Few of them are saved, because the repentance comes like Solomon's, only after the physical powers are broken down, when it is too late. Going to theatres or other crowded assemblages, thereby becoming overheated and breathing vitiated air are common exciting causes; imperfect domiciliary environment, such as too much shade and defective drainage. Improper cooking, improper clothing, such as a lack of sufficient disparity between the clothing of the body indoors and out-of-doors, especially in winter; poor ventilation, impure drinking water, and in cities poor plumbing, all contribute to prepare victims for this disease; the abuse of the voice in singing in a bad atmosphere, and its abuse by extra effort, are deleterious, as are also exhausting diseases of all kinds.

Climatic and seasonal vicissitudes play quite an important part, but are not properly understood. We may consider this topic under two aspects,—atmospheric and telluric. We cannot say, generally speaking, that humidity or dryness, variability or stability alone have striking effects for its production or prevention, for the disease originates and exists in considerable proportion in each of these conditions under the operation of other circumstances, so that it is perfectly fair to assume, in the light of statistics at hand, that too much importance must not be placed upon atmospheric conditions alone.

Telluric influences are quite as important for us to consider, inasmuch as we have an abundance of proof that low, damp, undrained, or overshaded localities will tend to the production of more cases, whatever the advantages of the locality may be otherwise, than any other situation. An elevated region, above five thousand feet, seems to show much greater immunity generally, than any other site of whatever nature. We have an example in the large, populous, elevated cities of Mexico, where the disease, in spite of overcrowding, ill-nourishment, squalor, filth, and prevalence of other disease has but a feeble existence; such immunity is not true of low regions—be they crowded or sparsely settled, warm or cold, dry or humid. Seasons in the north temperate zone have great influence in inciting the disease, both directly and indirectly, through the induction of catarrhal inflammations of the respiratory apparatus, and derangement of the functions of the liver and skin, producing faulty chemical processes and poisonous exhalations.

The disturbing influence of our spring and autumn in producing epidemics of influenza and so called malarial attacks is well known. It is attributed commonly to variations of temperature or humidity, but there must be something more than this, some occult cause even disconnected with ozone or any change of which we are now cognizant to account for it, because such changes are not always followed by like consequences. While the utmost pains taken for protection—the result of experience—will prove futile many times, nothing special that is known will secure immunity from "catching cold," as it is called. A *simple, abstemious, industrious and hygienic* life seems to be the best prevention against these physical revulsions.

These changes occur in almost every climate or district, north or south,

lowland or mountain, differing apparently only in frequency and degree, but of course being less deleterious in some places than in others. There are really but few equable climates.

To summarize: It may be stated that the chief *predisposing* causes of the various forms of pulmonary consumption are probably heredity and the other diseases of the respiratory apparatus; that the chief *exciting* causes are luxury, sedentary habits, squalor, dissipation, vitiated air, dampness of soil, unhealthy occupations and domiciles, absence of sunlight, night air (in humid climates especially), loss of sleep, acquired constitutional diseases, improper clothing, and in short anything which tends to lower the general vitality and diminish the bodily power of resistance.

The question of contagion is still unsettled, but proper hygienic conditions should always be attended to. Its prevention, then, would consist chiefly in careful marriages, proper care of the food, clothing and development of infants and children by their mothers instead of hired attendants, out of door life and exercise, difference of clothing for out-of-doors and in-doors, *proper* ventilation and heating of homes and places of occupation, good, properly cooked food, regular and temperate habits, cleanliness, the education of the skin by daily sponging with cold water and a reasonable avoidance of night air and crowded assemblies.

In conclusion allow me to remind you that pulmonary consumption is one of the diseases incident to civilization; neither man nor the lower animals in their pristine condition suffer from it, whether living in the Arctic or tropical regions, in the mountainous or lowland districts, unless driven by the encroachments of civilization from their native haunts and modes of life to artificial ones of semi-captivity, depravity, and squalor, or to a so-called higher intellectual plane, in which states they rapidly acquire it, and succumb to its devastating influence.

As the superlative type of artificial animal, then should we not pause a moment to recognize the evils which our incessant effort toward intellectual evolution is entailing upon the race, and, by proper observation and study of nature and her laws, so modify methods of education, mental culture, and social life as will preserve and develop the physical as well as mental organization? By such a course only can we hope to prevent the supremacy of such diseases as the one under consideration over the life of the nation.

DISCUSSION.

Dr. H. B. Baker, Lansing: The State Board of Health has recommended that the sputa of consumptive patients be always carefully disinfected,—so much faith has the Board in the micro-organism supposed to cause this disease.

Dr. McPherson, of Manistee: Do nationalities differ in their power to resist this disease? Are Scandinavians particularly susceptible? It is frequently remarked here that if a Swede, especially a woman between the ages of twelve and twenty, catches cold, it is apt to lead to death from consumption, and our physicians have frequently wondered why.

Dr. E. L. Shurly: I can not speak so much concerning the Swedes of Manistee, but in Detroit I have noticed that the greatest mortality from tuberculosis is among the Irish. Foreigners not being acclimated are more likely to take colds. Dr. McPherson's remarks are in harmony with what I have said, that consumption follows other diseases.

Dr. L. S. Ellis, of Manistee: The relation of tuberculosis to microbes is of great interest, and one which tends to make us enthusiastic, because if this relation is a causal one, we might destroy the microbe before it destroys its victims. I have in mind a family which has almost become extinct through this disease, and there are unmistakable signs that the rest of the family will go. Why does the disease thus follow this one family? It seems to me that the best explanation is the germ

theory of this disease. A few months ago I saw a consumptive patient expectorating on the floor. You can readily see how, this sputa becoming dried, the whole atmosphere of the house would become infected. This family moved out of this house and a friend of mine wished to move in. I felt obliged to tell him that he might as well move into a house infected with small-pox. It is sad to see how the Scandinavians are being swept away with this disease. So the Indians are all going with consumption. The Poles are also susceptible to consumption. This leads me to believe that a contagious element has got among them, and owing to indifference to the disinfection of the sputa, etc., it has spread from one to another. I think it one of the best evidences of contagion. Attention should of course be given to our surroundings. The living rooms of residences should be located on the south side of the house for the free admission of sunlight. Sunlight is just as necessary to a human being as to a potato vine, and it is better to have faded carpets than faded children.

Gen. B. M. Cutcheon, of Manistee: In the early history of Manistee little was known of consumption. Is the increase among the foreign or native population?

Dr. L. S. Ellis: In earlier years there were comparatively few cases of consumption, and in my opinion it was due largely to the manner of living. Then the people were robust and simple in their habits. The country being heavily timbered, was less susceptible to change. I am inclined to think that consumption has not made much increase among the native population; the foreigners are dying at a rate greatly in excess of the death-rate among the natives.

Dr. Fairfield: What was the probable cause of consumption in a family where the father and mother were healthy at 60 years of age, and their children died at ages of from 18 to 40 years, of consumption?

Dr. E. L. Shurly: I saw a family similarly affected a few years ago, which at first I thought good evidence of contagion but afterwards I found other contingencies. I found the microbe in each case, but I also found that the parents had descended from tuberculous ancestors. Was the microbe or the ancestors the cause? If only one parent has the consumptive tendency, the disease may not persist. In my experience I have met with only two cases where there seemed to be no other explanation than contagion. Many cases, as where the family separates and the children all die of consumption, can not be explained on the ground of contagion.

THE HYGIENE OF SCHOOLS, SCHOOL BUILDINGS AND GROUNDS.

BY PROF. ALBERT JENNINGS, OF MANISTEE.

The sanitary convention is one of the characteristic products of modern civilization. Its deliberations indicate a systematic plan on the part of scientific experts to make every advance in human knowledge contribute to the improvement of the conditions of life. This is the true philosophy of science. In all historic times, man has been making inventions and discoveries, and has steadily broadened his horizon of knowledge. He has increased his power over nature and his capacity to produce what he desires for the supply of his wants. Physically and mentally, there has been no perceptible progress towards a higher type. Race characteristics remain precisely as they were when our Aryan ancestors left their ancient homes. There were as splendid specimens of manhood in the age of Pericles as in the nineteenth century. The mariner's compass, the printing press, the steam engine, and the telegraph have given each man a hundred hands for production, but his physical mechanism is not in any respect improved. And yet it is the hope of medical science that the great principles of hygiene may be so understood and applied as to produce a measurable improvement in the natural powers of the human race.

In the study of hygiene, special attention has lately been given to the conditions and environment of school life. Scientists are investigating the

hygiene of the home and its surroundings, the shop, the factory, the mine, the camp, the hospital, the prison; but in the last decade, the hygiene of the school has taken its place among the most important of all. The structure of our social system demands that all the people must at some time in their lives devote a series of years to school life. This is compulsory and all the coming generations must submit, whatever may be the effect upon the health. We necessarily collect large numbers of children in one room and keep them in such restraint that discomforts and inconveniences which in home life would be quickly remedied, must here be endured without complaint. The effect of unhealthful conditions upon growing children must be more disastrous than upon adults. It is clear, then, that among civilized nations, the average hygienic condition of the school-house is not merely a subject of passing comment or querulous complaint. It is a subject upon which all the people should be aroused and thoroughly informed.

The discussion of this topic may be arranged in the following divisions:—1. What conditions are necessary to the health and comfort of pupils and teachers in our schools? 2. What is the actual hygienic condition of the average school in cities and towns and in the country? 3. What are the available remedies for existing evils?

The first question is not a new one in sanitary conventions, although historically it is a very modern inquiry. In the days of our fathers little was said about the evils of vitiated air in school-rooms.

The location of the building was not criticised because a swamp happened to be in sight from the windows. The water-supply, the sewerage, the temperature of the air in the room, the direction and amount of light, the height and shape of seats and desks, were never subjects of investigation, but were wholly regulated by considerations of economy and convenience. Among the modern educational improvements, we have introduced an excess of carbon dioxide, together with organic matter and watery vapor from the lungs and skin. We can boast also of microbes and bacteria, of microscopic animal and vegetable organisms and atmospheric dust, of the detritus of animals and plants, of nitrates, sulphates, chlorides, free acids, and many other interesting things, all floating in the classic atmosphere of our modern school-rooms. These things have been investigated by scientific men, but the great majority of pupils and teachers are happily unconscious of their presence. The prime object of the papers on this topic, presented from time to time at sanitary conventions, is not to give information to the company of learned physicians who are members of the convention, but it is to call the attention of the people to the needless suffering endured by their children in ill-ventilated and poorly-constructed school-houses, and also to familiarize all with principles and practical remedies.

Of all the requisites necessary to the hygienic condition of schools, the greatest is good ventilation. This subject is of overwhelming importance, and the elementary principles should therefore be repeated so often that the people will be compelled to understand them. To this end we will devote a part of this paper to a recapitulation of certain elementary facts which may represent the net result of the latest investigations of science.

The atmosphere when pure is substantially of the same composition in all parts of the world. It is a perfect mixture of the gases nitrogen and oxygen together with a small portion of carbon dioxide, the latter being a chemical combination (not a mixture) of carbon and oxygen. These gases are mixed

in the following proportion: Oxygen 20.96 pr. ct., carbon dioxide .03 pr. ct., and nitrogen, 79.01 pr. ct., which numbers added together make up the whole, or one hundred per cent. In order to be best adapted to the purpose of respiration, the proportion which I have stated must be closely maintained. When the air is taken into the lungs in breathing, it is exhaled with the proportion slightly changed, but that change is sufficient to make it incapable of supporting combustion and unfit for respiration. When expired air is dried, the average percentage composition is as follows: Oxygen, 15.56 pr. ct., carbon dioxide 4.34 pr. ct., nitrogen 80.10 pr. ct. Here we have more than 100 times as much carbon dioxide and a little less than four-fifths as much oxygen as when the pure air entered the lungs. When the air is exhaled, a small and varying amount of watery vapor goes with it and also a minute quantity of organic matter. This *organic matter* is an important factor in respiration because it is a powerful agent in vitiating the air. Its composition has never been ascertained and its quantity has never been precisely determined. It has a fetid odor and is the source of the disagreeable smell noticeable in vitiated air. It is not equally diffused through the air and will sometimes remain in a room for some time after pure air is admitted freely.

For a long time it was a difficult problem to estimate the vitiation of air, contaminated by respiration, because the organic matter could not be measured. Prof. Pettenkofer of Munich showed, however, that the amount of carbon dioxide in expired air is constant and may be taken as the measure of vitiation. It diffuses itself uniformly, and there is no limit to the capacity of the air for holding it. If then the amount of carbon dioxide in the air of a confined room is measured and compared with the normal amount, it will disclose the extent to which the air is vitiated, because the organic matter is supposed to increase in the same ratio as the carbon dioxide.

The decrease in the percentage of oxygen is also an indication of the extent of vitiation. This decrease, when caused by breathing the air, is of course accompanied with an increase of carbon dioxide. When the precentage of oxygen is decreased by other means, the carbon dioxide remaining the same, a considerably greater change can be endured without making it impossible to breathe it. Angus Smith found that candles were extinguished when the oxygen was reduced to 18 per cent, the carbon dioxide remaining normal. It is much more convenient, however, to estimate the amount of carbon dioxide than to determine the percentage of oxygen. The proportion of carbon dioxide is, for convenience, usually expressed in ten thousandths; for example, three hundredths of one per cent is said to be three parts in ten thousand. We have given this as the normal proportion in air that is absolutely unvitiated and is perfectly fitted for respiration. It is, however, not by any means constant in outside free air. In cities it is usually four or five parts, and in bad localities it may be as high as seven parts. In the air outside of our school-houses and dwellings we may expect about four parts. In the composition of the air the carbon dioxide seems to be an added and somewhat varying component. The proportion of the nitrogen and the oxygen is very uniform in free air.

Many experiments have been made to determine the amount of carbon dioxide that can be endured by the lungs. In studying the results of these experiments we must keep in mind the fact that an excess of carbon dioxide produced by respiration in confined air indicates a much greater degree of vitiation than if produced by other causes. For example, Pettenkofer was

able to stay a long time in a room containing 100 parts in 10,000 of carbon dioxide, and Förster stayed for ten minutes in a room with 400 parts of that gas in 10,000 without any great discomfort. In both of these cases, however, the gas was produced chemically. Pettenkofer liberated it from bicarbonate of soda, and in Förster's case it had been produced by fermentation in a wine cellar. Pettenkofer says that the air of a room containing 10%, that is 100 parts in 10,000 of carbon dioxide, would be almost intolerable. Dr. Kellogg says that experts generally have reached the conclusion that if the quantity of carbon dioxide be increased to 6 parts in 10,000 by the respiration of animals, it is no longer fit to breathe, and if longer breathed will produce serious disease.

This is undoubtedly our safest standard, but it is one that is seldom attained in practical life. On this point I will quote from Prof. R. L. Packard: "The standard or limit selected by Pettenkofer was the amount of carbon dioxide found in room air which was decidedly objectionable to the senses, and which had produced injurious effects on health. He inaugurated a series of determinations of the carbon dioxide of the air in different dwelling rooms, in some of which the air was not perceptibly bad and the inmates had never felt any discomfort, and in others where the sensations, subjective impressions, and medical experience all showed something abnormal, and also in barracks, hospitals and prisons in Munich. In a dwelling house in the daytime the CO^2 averaged 6.8 parts in 10,000, beginning with 5.4 and increasing to 8.7 within a few hours. In a sleeping room at night with the windows closed, there were 23 parts in 10,000. The long list of experiments made by Pettenkofer and Oertel in prisons, hospitals, etc., showed that the carbon dioxide ranged from 13 to 56 parts in 10,000 and proved that 10 parts indicated the limit between bad and good air. At 20 parts the air showed all the signs of great vitiation, that is, it was 'close' and disagreeable. Pettenkofer took pains to point out that the increased amount of carbon dioxide in room air is not itself a source of injury, so much as a convenient measure of vitiation, and his rule is that whenever the air of a room contains over 10 parts in 10,000 of carbon dioxide, due to respiration and perspiration of the inhabitants of the room (there being no other source of that gas than the outer air with 3 to 4 parts of carbon dioxide), such air is unsuitable for continued breathing. The sense of smell is indeed affected by the organic matter when a person from the outer air enters a room where the carbon dioxide is 7 parts in 10,000, but 10 parts may be allowed in rooms containing many persons."

We may notice in passing that a person may live and breathe in an atmosphere in which candles will not burn and a match can not be ignited.

In this climate, it is evident that ventilation must be a part of the system of heating. School rooms should not be heated by radiation from a hot surface within the room, but fresh air should first be warmed and then thrown into the room.

In providing for ventilation, we should first establish a strong current out of the room. This can be done by connecting the lowest part of the room with the hot flue in the chimney. This upward current is the foundation of success in ventilation, and the flue used for this purpose should be of sufficient dimensions and heated at all seasons of the year. The rule for computing the velocity of this current per second is to multiply the square root of the excess of temperature of the air in the flue over that of the outside air, sta'ed

in degrees F., by the square root of the height of the flue in feet, and to divide the product by 4, the result being in feet per seconds. This applies when the air enters without obstruction. If the air is conveyed to the flue by a duct, every bend at right angles in such duct divides the velocity by 2.

In estimating the size of openings for the exit and entrance of air, it is common to compute the requisite size of the register admitting the air and then make the opening outward double this area. This tends to increase the suction of air from the room and to prevent a perceptible current of cool air towards the flue.

The importance of making these openings large enough has never been fully appreciated by teachers or by the public, and, judging from their work it is not even thought of by most architects. The necessary size is susceptible of accurate and easy computation, when certain data are known. In fact it makes no difference, within certain limits, what amount of space may be allowed for each person, if these openings are of sufficient size. Dr. Kellogg estimates as the very lowest limit 1-20 of a square foot, for each pupil, in the fresh-air opening, if unobstructed, and twice that amount if covered by a register. As the latter is almost always the condition we may call the lowest limit 1-10 of a square foot. Thus 40 pupils will require a fresh air register 2 feet square, and a cold air outlet 2 by 4 or its equivalent. In many cases the best plans for ventilation are defeated by the small size of the registers.

It is especially necessary that means should be provided for heating the outgoing flue in moderate weather. In cool, damp days in the spring and autumn the ventilation of school rooms is usually very poor. It is then too cool to open the windows, and not cold enough to send hot air into the school-room, and no perceptible current can be found at the registers.

It will be noticed that really good ventilation is very expensive in the matter of heating. When the air is constantly changing, we must be all the time heating a cold room. It may indeed be compared to heating a passing breeze.

Another difficulty is that in most school-rooms there is no provision for introducing cool air through the fresh air register when the temperature of the room is too high. The only remedy generally for too high temperature is to close the hot air register, and perhaps open the windows. This suddenly cools the room below the normal temperature and the register must be opened again, and, if the fire has not gone down in the meantime, the same operation will be repeated. Ventilation in cold weather by means of open windows and doors is always dangerous. It is often urged upon teachers to flush out the room with fresh air frequently by opening all the windows and doors. This is better than to endure the evils of foul air, but it is an evil in itself.

The second division of our subject is the consideration of the actual condition of school buildings generally as to ventilation. I am aware that in sanitary discussions it is common to find fault vigorously and impartially with everything that comes under our observation. There can be no dispute, however, about the condition of school-houses and other public buildings as to means of ventilation. I believe that not one per cent of the rural school-houses in Michigan have any means of ventilation whatever, except by open windows and doors. Furthermore, the subject is not even agitated among the teachers who occupy those houses, or among the people who send their children there. There is no scientific subject more completely ignored throughout the country than this subject of practical ventilation of school

buildings. These country school-houses are in almost all cases heated by large stoves. A very little added expense would provide a jacket for the stove with a fresh air opening beneath, and an opening into a flue at the base of the chimney. A good plan would be to make the jacket close at the top of the stove, with a register to cut off the warm air when the stove is overheated.

In cities and towns, ventilation is generally a failure, except in the newest and finest buildings. It has been thought by some experts that perfect ventilation of large buildings is absolutely unattainable except by means of fans driven by steam. It is evident, however, that school-rooms containing from 40 to 50 pupils, can be fairly well ventilated.

The remedies for these existing evils must be a matter of growth. The first essential is to educate the people and arouse their interest. The theories of ventilation should be taught in schools along with the lessons on physiology. To do this, of course the teachers must inform themselves. Probably not one per cent of the teachers in the public schools in this State have given any special attention to the practical means of securing good ventilation in dwelling houses and public buildings. How many teachers in school buildings heated by steam or by furnace, can tell you exactly the source of the air which comes into their rooms? Every intelligent patron of any school should inform himself by personal inspection as to the methods of heating and ventilating the school building.

Legislation will not cure all evils, yet I believe that some wise legislation is desirable on this subject. There should be established a general system of sanitary inspection of school-houses and other public buildings. This has been done in Germany and France and other countries of Europe for a long time past and it has been found entirely practicable. The German states very generally regulate by law the location, arrangement and management of school-buildings in accordance with hygienic requirements. The architectural details of school buildings, such as the lighting, heating, mode of ventilation, floor and cubic space for each pupil, are thus regulated by law, and conformity to requirements is looked after officially by medical inspection. In cities it would be quite easy to have the air in every school-room inspected and tested at certain intervals and a record made of the result. The laboratory apparatus necessary for a fairly accurate test of school-room air is not very complicated and teachers generally could easily learn to use it.

There are three things which constitute what may be called the climate of the school-room. They are the temperature, the humidity and the purity of the air, the latter to be determined by Pettenkofer's principle of measuring the amount of carbon dioxide. The currents of air at the registers should be frequently measured by the anemometer and estimates made as to the volume of air actually removed from or brought into the room each minute. Very important observations may be made daily with the hygrometer, the thermometer and the anemometer.

It has seemed desirable to confine the discussion of my topic to-day mainly to the subject of ventilation in schools. I have recapitulated some familiar principles connected with the chemistry of the atmosphere, because I believe all intelligent interest which we can arouse on the subject of ventilation must be founded upon a knowledge of such principles. The most important conclusions which I desire to reach in this paper are that we need a more definite knowledge of details in the study of practical ventilation; that

teachers generally should familiarize themselves with certain comparatively simple methods of measuring the vitiation of air, and should keep a careful record of the condition of the atmosphere in their school-rooms, as indicated by such tests; and that all public schools should be subject to a system of official inspection by medical experts with a view of regulating and improving their hygienic condition.

DISCUSSION OF THE SUBJECT OF SCHOOL HYGIENE.

BY A. ARNOLD CLARK OF LANSING.

The hygiene of schools includes the ventilation and warming of buildings, the location of buildings and grounds, the prevention of contagious diseases, the much vexed questions—"recess or no recess,"—high pressure,—in fact the hygienic basis of our whole school system.

Are school children overcrowded with work? What shall we say to this question asked every day by anxious parents? As a class, physicians and teachers have not agreed very well in the past on this point. They divide a boy up into sections, and the teacher thinks it a very fine thing for his mind, and the physician thinks it a very bad thing for his body. I do not think our school teachers are particularly to blame for over-pressure, but it would be strange if we did not find in the schools what we find everywhere else in America. The last words of warning left us by Herbert Spencer were, that we did every thing too fast. Dr. J. B. Andrews, in a paper before the International Medical Congress, shows that insanity is greatly on the increase in the United States. I believe that nervous diseases generally are increasing. In business, men worth millions fret and worry from sunrise to sunset as though they expected to go to the poorhouse to-morrow Even in society we hurry. Our amusements must get more and more exciting. It is said that we even dance faster than they do in Europe.

So in our schools, like Dr. Blimber, we try to produce intellectual green peas at Christmas. Too often we crowd the brain with more than it can digest and our scholars become intellectual dyspeptics. They soon have no taste for any intellectual food. They become irritable and fidgety and want to be "given a rest." The carpenter is trying to use a dull saw. The brain which should be building up new cells is repairing broken down cells. The result is to cultivate the memory at the expense of the reasoning powers, to make a warehouse of the mind, and store it with facts. The scholar, like Mr. Toots, becomes sort of an "intellectual barrel organ," grinding out tunes. Turn on his "Virgil stop," turn on his history stop, work the pump handle, and he is ready to grind.

I do not say that over-pressure is to be found everywhere in our public schools, but that it is too much the tendency. For instance, Dr. Lundy said at the meeting of the American Public Health Association, in Detroit, in 1883, that he then had a patient under his care suffering from some eye trouble, and that this patient had six recitations a day, each forty-five minutes long, that she was expected to study five hours at home, and did. Besides all this she studied music. Dr. Hammond, of New York, told recently of a girl brought to him suffering with St. Vitus dance. He found in her book bag an English grammar, arithmetic, geography, United States history, astron-

omy, physiology, French reader, French grammar, and a treatise on general science. He says that she had "learned these things at the expense of her brain capital, not her brain income." The brain had been using the sinking fund for running expenses.

It is no wonder that little Paul Dombey, after he had been under this sort of regime for a while, got the idea that Romulus and Remus were Troy weight, that the Continental Congress was one of the parts of speech, that *hic haec hoc* was a mountain in Asia, and 3 times 4 was 1776.

A few years ago at an examination of girls in the parish schools of London, when prizes were offered by the National Health Society, one young lady said that the "function of the heart" was "between the lungs." Another thought the skin discharged a function called perspiration. One said there were "two kinds of skin, the derby and the epiderby." One bright young lady, who must have been an expert in ventilation, said, "To find the number of cubic feet in a room, you multiply the room by the feet, and the product—is the result." One mathematical genius proclaimed that "Things equal to each other are equal to most anything else," and that "a straight line is one which is the same distance apart at both ends." It is better for a child to digest a page than swallow a book. I can't help but believe that these ludicrous examples are evidence that our school children are studying too much and too long. And when I am told that the scholars in the grades and grammar schools of New York are expected to study ten to thirteen hours a day, I say it is too much for their health and intellectual development.

I admit that there are other causes of ill health among scholars, such as late parties. I am glad to admit that the brain-working classes live longer than others, but, among brain workers, preachers live longer than teachers, and of all brain workers preachers are probably the most evenly developed. They don't have much worry, live on princely salaries, have good food and plenty of air, and they take a great deal of physical exercise. While they are brain workers, they don't crowd the brain like school teachers and scholars. They don't work twelve or fourteen hours a day with exclusively brain work. The mortality among doctors is higher than among preachers; this is probably due not to greater brain work but to the great exposure to communicable diseases for the good of humanity. Lawyers don't live so long as preachers because of the great amount of intellectual drudgery incident to a lawyer's life. Their clients don't live so long as they do. Of all classes, those who work in the trades die the earliest in life. Yes, the brain workers live the longest, but not the brain overworkers. If the hours of school were much shortened, and the scholars gave their spare time to physical or industrial training, it would be much better for the pupil and teacher, less fret, less drudgery, clearer brains and better reasoning powers.

For the same reason it seems to me that the movement to do away with the recess is a movement in the wrong direction. It is estimated by the best authority that a very young child can only study one subject two minutes, between the ages of 5 and 8, 15 minutes, at 12 years of age, 30 minutes, but this not more than three hours a day. I fear that teachers with trained attentive powers do not always appreciate this. The expert penman does not tire so quickly as the green hand, but after writing a few hours the muscles of his fingers tire. A man runs a mile and the muscles of his limbs need a recess. We talk of shoemaker's cramp and ballet dancer's cramp; so, constant application gives us the headache and makes us near-sighted, brain and eye cramp.

Introduce physical training in the public school, however, and the "recess or no recess" problem is solved.

So far I have not spoken of the effect of long hours of study on the eyes. In this connection, the experiments of Prof. Cohn in Germany are frequently cited. The eyes of over one hundred thousand students in Germany have been examined, and it has been found that near-sightedness increases with attendance at school. Prof. Agnew conducted similar experiments in New York, Brooklyn and Cincinnati and came to the same conclusion,—where only three in a hundred of the younger pupils were near-sighted, among scholars 23 years old 27 in every hundred were affected. "The near-sighted eye is an abnormal eye." Dr. Connor of Detroit says that a large number of statistics show that, among students of the same grade, where they study 2 hours out of school, 17 per cent are near-sighted, while among those who study 6 hours out of school 40 per cent are near-sighted. These statistics of Cohn and Agnew should not be overlooked by those who think scholars can do without a recess.

There are other causes in the school-room, besides constant application, which injure the eyes and health, such as bad ventilation, bad type, glazed paper and desks at an improper angle. It is pretty well settled that the only place for light is over the left shoulder, yet there are school-houses with light staring the scholars in the face so that it is impossible to see the blackboard. It is well settled that every scholar should have from 250 to 800 cubic feet of air-space, yet there are school-houses in Michigan where scholars have only 100 cubic feet and the room is full enough of carbonic acid gas literally to knock one down. In connection with dwelling houses we often hear quoted what is called "Farr's Law of Density"—"The nearer people live to each other the shorter their lives are," and why should this not be as true of the children in school as of the parents at home?

I regret that our information is not more extensive concerning the condition of school-houses in Michigan. The State Board of Health has sent out requests for suggestions concerning plans for model school-houses and it is expected that these plans will soon be perfected, but I wish that more information might be obtained concerning the present condition of school-buildings. For example, how many are located on a high, dry soil, how many on a low, damp soil? How many cubic feet of air per head? How is the light admitted? How about ventilation, desks, books and water supply? Are the seats made to fit the child's back or the child's back made to fit the seats? Is there a cloak room, if so how is it ventilated? Is there any provision for drying wet clothing? How many of the scholars have sore eyes, nervous diseases or spinal diseases, and, perhaps most important of all, how many cases of contagious disease during the past year can be traced to the school? How many boards have regulations to prevent children from infected families attending school, and how long after recovery before a student is allowed to come back? Ten years ago a committee of the Medico-Legal Society of New York reported that it was not uncommon for scholars to return to school two or three weeks after being sick with scarlet fever and measles. This is a question frequently asked at the office of the State Board of Health,—shall the school be closed? If patients and those exposed were properly isolated, if, after recovery, clothing were disinfected, and the patient were restrained for several weeks after complete recovery, it would seldom be necessary to close the school.

But to carry out a thorough inspection, every school should have a medical or sanitary inspector. I am glad to say that the school board of Baltimore has requested the city council to appoint a sanitary superintendent of schools, who shall be an expert, to advise concerning the improvement of the sanitary condition of school-houses, examine text-books before their adoption, to take measures to prevent contagious diseases, to examine the eyes of the pupils at stated intervals and to give lectures to the teachers on school hygiene. In our smaller schools such an inspector might be an instructor in hygiene. He might present to the scholars in practical form the most recent and important sanitary knowledge. He might tell them about this dread disease consumption which carries away 1,600 of our citizens in Michigan every year. He might teach them how typhoid fever varies with the rise and fall of the ground water, how the germs of this disease, found in water-supply, when injected in cats and dogs had produced typhoid in those animals, and then he might tell them how boiling the water would destroy those germs. He could tell his scholars how the germs of diphtheria may linger for months or years about the clothing or drapery of our rooms and then suddenly break forth as violent as when they first emanated from the body of the infected person. He could then tell them how these germs cannot live in an atmosphere of burning sulphur, how disinfection stops infection.

I am not sure but this would be the most interesting class in school. I am not sure but it is as stimulating to the imagination to know that every drop of water is an inhabited world as it is to speculate about other inhabited planets. I am not sure but this germ army is as interesting as Blücher's soldiers at Waterloo; and while I would have scholars understand the laws of mathematics and physics and learn all about the delicate instruments of modern science, I would have them know that the human body is a delicate instrument which responds to changes in the temperature and weather as truly as the thermometer and the barometer, registering cholera morbus when it is hot, and pneumonia when it is cold. I would have them taught what John Tyndall calls the "morality of clean blood." I would have them know that the "human body is a well-set clock which keeps good time, but tampered with too much, the alarm will run down before the hour is set."*

Mrs. William H. Willard, of Manistee, being called upon, stated that she was in favor of recesses in the summer time. The tendency is to crowd the scholar too much. The sessions should be shorter, with fewer studies.

Prof. Jennings said that he favored exercise for boys and girls, though manual training had not yet been adopted in the Manistee schools. He agreed with Mr. Clark about the shortness of time possible for children to devote to study. There were probably not many present who could study one-half hour consecutively. Physical exercise should have the appearance of being voluntary. This would give the scholar a liking for school. A system of calisthenics is in operation in Manistee, except in the higher department, and it is needed there.

Hon. T. J. Ramsdell thought that military drill must result in great physical good, and expressed the opinion that more work would be accomplished in an hour and a half with good physical training than now in five hours.

Fifth Session—Wednesday, June 6, 7:30 P. M.

At the fifth session of the convention, Rev. A. Walkley gave an unwritten address on the restriction of communicable diseases from the standpoint of the clergyman.

Dr. Crosby, of Ludington, being called upon, said that the fundamental principles of medicine

*Bishop Hall.

were as well settled as those of any science, and the trouble was, that the rules, laid down by the State Board of Health for the restriction of communicable diseases, were not followed. The health officer, to do this, should receive the coöperation of the entire medical profession.

Dr. J. A. King spoke of the money value of restricting communicable diseases, and said that the city could well afford to pay a good salary to the health officer. The present salary of four hundred dollars would not furnish him a living.

Dr. Baker endorsed the proposition to sustain the health officer. He said that in Manistee the health officer should receive $2,000, and should be, as required by law, a well-educated physician.

Hon T. J. Ramsdell said the health officers of Manistee had been very zealous in efforts to suppress communicable diseases, and had received strong opposition. This was largely due to the foreign element, and the indifference of the city council. In large cities the health officer has more power. His authority is supreme. When our health officer has autocratic power, we may hope to be truly sanitary.

THE PREVENTION OF THE COMMUNICABLE DISEASES,

FROM THE STANDPOINT OF THE STATE BOARD OF HEALTH.

BY HENRY B. BAKER, M. D., SECRETARY OF THE MICHIGAN STATE BOARD OF HEALTH, LANSING.

Since this topic was assigned to me I have not had an opportunity to obtain a formal expression of the views of the State Board of Health on the subject, therefore the Board should not be held responsible for all I may say; but, judging from its work during the past fourteen years, the Board, evidently, believes that the "Prevention of the Communicable Diseases" is one of the most important measures which can engage its attention, and that work for this purpose is the most important that local boards of health can undertake. It is not difficult to imagine why this is true, because, by studying the vital statistics, it is found that the diseases which cause the greater proportion of the premature deaths in Michigan are the communicable diseases. Named in the order of their importance, the five diseases which cause most deaths in Michigan are: (1) consumption, (2) diphtheria, (3) pneumonia, (4) typhoid fever, and (5) scarlet fever. Excepting perhaps pneumonia, these are all communicable diseases; in common parlance, they are "catching;" not all of them are contagious, but all are in some manner spread from person to person. It thus appears not only that the communicable diseases have caused a large proportion of the premature deaths, but a large proportion of *all* the deaths, and that if we should prevent these communicable diseases we would change the character of our vital statistics,—a much larger proportion of our people would die in ripe old age, a much larger proportion of the living inhabitants would be in the vigor of youth, and in the productive and enjoyable period of middle age; there would be prevented in each year, in this State of Michigan, two or three thousand deaths of children from diphtheria and scarlet fever, and perhaps a thousand deaths of persons in the prime of life, from typhoid fever. Knowledge of these facts should prompt to greater efforts for the prevention of these diseases, and, inasmuch as we now know how to prevent them, it seems strange that people do not uniformly act for their prevention. Probably the people would so act if they all knew that so large a proportion of the mortality is caused by these diseases, that they *are* preventable, and especially if all knew just *how* to prevent each one of these diseases.

These sanitary conventions do much to spread such information; but they do not reach the people of the whole State fast enough, and the local boards of health, engaged as they are, in the active work of restricting diseases which should have been prevented, and in other practical sanitary work, need the aid supplied by the different lines of work carried on by the State Board of Health, in order to spread that information which is essential to induce the people generally to sustain and coöperate with the local health authorities in restricting and preventing these diseases.

SOME OF THE WORK OF THE STATE BOARD OF HEALTH.

By means of reports from local health officers, physicians and others, and in all practicable ways, the State Board of Health collects information on these subjects; and in all practicable ways it seeks to spread this information "where it will do the most good." It aims to "strike while the iron is hot"—that is, it tries to have the information which it collects, and the best advice which it can give, placed before people at such times that it will be most likely to be accepted. Pamphlets, such as are distributed in this audience, containing concise statements of facts and directions how to restrict each one of these communicable diseases, are sent to localities where the diseases occur, to be distributed to the neighbors of the families in which the communicable disease occurs, because at such times of danger the neighbors will be most likely to read such pamphlets, and because after reading them they will then be most likely to coöperate with the local health officer for the restriction of the disease. Thousands of pamphlets on each of the most dangerous communicable diseases are distributed by the State Board. They are being distributed all the time. In order to distribute each kind of pamphlets in the localities where there are persons sick with the particular communicable disease of which that kind of pamphlet treats, it is necessary to know the localities in which each such disease occurs; and this information to the office of the State Board is provided for by a law which requires every health officer in the State to keep the secretary of the State Board of Health constantly informed on this subject. There are in Michigan over 1,400 local boards of health,—each one required by law to have a health officer. The law requires every householder and every physician who knows of a case of one of these dangerous diseases under his care to promptly notify the health officer or other officer of the local board of health. When these laws are faithfully obeyed, the local health officer can take prompt action for the restriction of the dangerous disease, the secretary of the State Board of Health can promptly supply pamphlets of instructions which the health officer can distribute to the neighbors, and frequently the central office can take other action which tends to aid the local officer in restricting the outbreak and preventing an epidemic; and what is of even greater consequence, in so educating the people of that vicinity that thereafter they will be more ready to restrict that disease, and many of them be able to prevent outbreaks which otherwise would occur. Although this method of teaching the prevention of each of these diseases, while the disease is threatening, seems to be the best that is practicable for the State Board of Health, it seems too bad that it is not possible for the people of a locality to learn before a first outbreak occurs; but something like experience or personal observation seems to be essential in order to awaken sufficient interest in the subject.

But while it is probably impossible to reach the adult population with facts and advice on these subjects faster than in some such way as it is being done by the methods just described, it certainly seems possible, so far as concerns the rising generation, to strike at the root of *this* ignorance which annually causes the death of thousands among us. This leads me to say that, in my opinion,—

THE PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES SHOULD BE TAUGHT IN THE PUBLIC SCHOOLS.

As that knowledge which tends *directly* to the preservation of life is of more worth than that knowledge which tends indirectly thereto, the teaching of physiology and hygiene in the public schools as it is usually done may well be displaced by the teaching of the exact measures required for the prevention of those dangerous communicable diseases which cause the greater part of the deaths. Of course, if the teaching of physiology and hygiene as it is usually taught is of more consequence than some other studies, the displacement should be of such other studies; but the thought I wish to convey is that, whatever is displaced, it is of prime importance for the welfare of humanity that the exact principles of the prevention of those diseases which cause the most deaths should be taught in the public schools. It is as true now as when the Bible was written that "My people are destroyed for lack of knowledge."*

When the present methods of teaching "physiology and hygiene" were invented, *sanitary science* had not been evolved; but now we know approximately what diseases kill us, and we know how to prevent the most important of them. Is it not high time this knowledge was being utilized by the teachers throughout this country, for the saving of the lives of those whom they are educating?

Here let me answer the question which some of you are wishing to ask—How do we know that we have that valuable knowledge directly useful for the saving of life? The answer is: Because whenever we act upon that knowledge the saving of life follows, and it follows so uniformly that we have come to believe that it is a result of such action. A few illustrations on a large scale are as follows: Computations, made and published a year or two since † show that since the State Board of Health was established, and the approved methods for the restriction and prevention of small-pox have been attempted, the deaths from small-pox in Michigan, returned to the office of the Secretary of State, have been much less than during the five years just before the Board was established. Compared with that period, and making allowance for increase of population, about 1,000 persons appear to have been saved from death from small-pox in Michigan during the eleven years, 1873-84. Similar computations indicate that about three thousand persons were saved from death from scarlet fever in Michigan during the same period of time.

Coming down to a more recent period of time, official reports from the health officers in Michigan for the year 1886, have been compiled, and among the pamphlets distributed in this audience you may see two diagrams which exhibit graphically some important facts worked out, by Mr. George E.

*Hosea, Chap. III., 6.
†Proceedings Michigan State Board of Health, pp, 11-16; Annual Report Michigan State Board of Health, 1886, pp, 177-181.

Willitts, in the office of the State Board of Health. From the diagram relating to scarlet fever, you may see that while in those outbreaks in which isolation or disinfection was neglected there was an average of nearly fourteen cases to one outbreak, in those outbreaks in which both these approved measures were enforced, there was an average of less than three cases to an outbreak—therefore, there were eleven cases to an outbreak saved by the more perfect methods, namely by isolation and disinfection. That is, in the fifty-eight outbreaks in which the more perfect methods were enforced there was, compared with those of less perfect methods, a saving of 638 cases of sickness and forty-eight lives from this one disease in a single year. Probably the saving of life and health through efforts at the restriction and prevention of scarlet fever in Michigan in that year were many times what these figures show; but these figures supply a scientific basis for the comparison of two methods of action. The facts are obtained from the official reports of the health officers in whose jurisdictions the outbreaks occurred, and they are reliable so far as relates to all outbreaks properly reported.

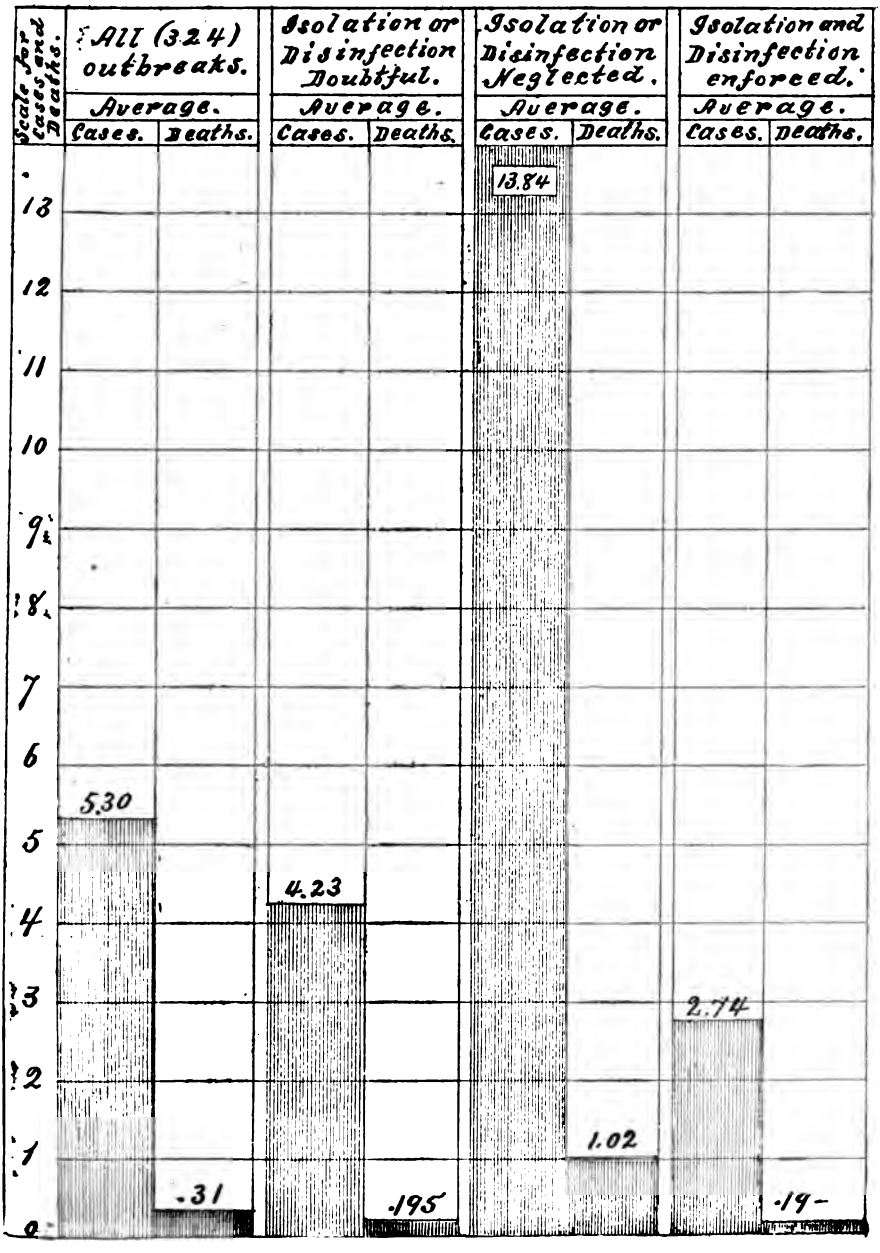
The other diagram before you, relating to diphtheria in Michigan in 1886, shows even a greater saving of life and health through efforts for the restriction and prevention of that disease, there being an average of over sixteen cases to an outbreak in those outbreaks in which isolation or disinfection was neglected, while there were less than three cases to an outbreak in those outbreaks where both isolation and disinfection were enforced,—a saving of over thirteen cases and over two deaths to each of the 116 outbreaks in which the more perfect methods were employed, compared with those outbreaks in which one important part of the work was omitted. This indicates that in the 116 outbreaks alone there were saved 298 lives and over 1,500 cases of sickness from diphtheria in Michigan in a single year by improved methods for its restriction and prevention.

These computations from official reports are submitted, not as indicating the total saving of life and health from diphtheria and scarlet fever in that year by such efforts as are recommended by the State Board of Health, but as supplying positive evidence that these diseases *can* be restricted and in great part prevented whenever the people and their officers coöperate promptly and fully in obeying the laws, and in carrying out the advice which is freely given by the State Board of Health.

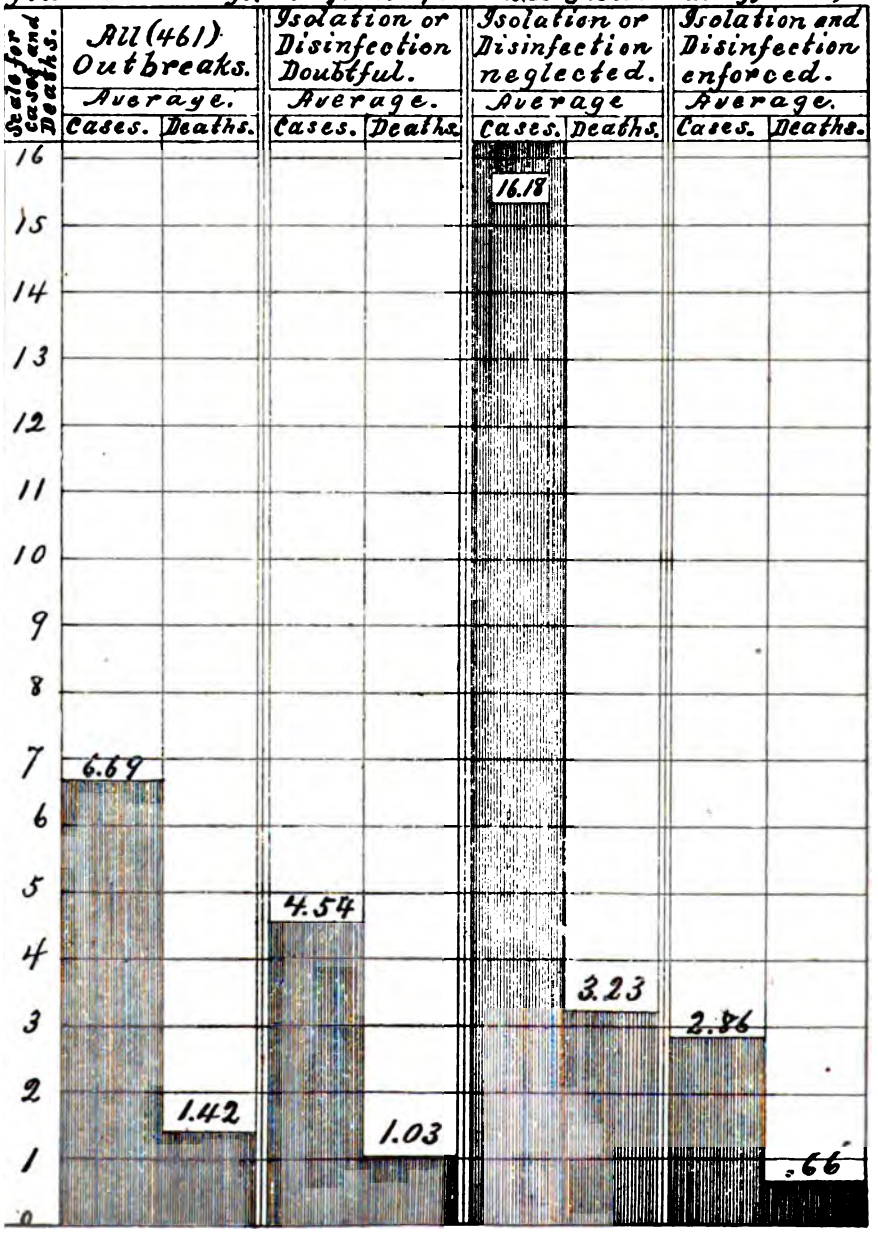
If you ask what is that advice which the State Board of Health gives,—what, in its opinion, are the best known measures for the restriction and prevention of each of the dangerous communicable diseases,—I must say that the time at our disposal this evening will hardly permit of my stating the advice in full; but it may be said that the methods are not the same for all diseases. Thus, the most important preventive of small-pox is vaccination; and small-pox, diphtheria and scarlet fever are *contagious* diseases, and demand isolation of the sick, and disinfection of the entire contents of the house, or at least of the room in which the disease has been; while typhoid fever is probably not contagious, but demands the disinfection of all bowel discharges, and especial care for the protection of the purity of the drinking water. The spread of consumption may probably be lessened by the thorough disinfection of all the sputa of consumptives.

But for full though concise statements, I must refer you to the several pamphlets which are published by the State Board of Health for gratuitous distribution, copies of which have been distributed here this evening, and

Scarlet fever in Michigan in 1886: The Average Numbers of Cases and Deaths per outbreak:-1, in all the 324 outbreaks reported; 2, in the 221 outbreaks in which it is doubtful whether or not Disinfection or Isolation were secured; 3, in the 45 outbreaks in which Isolation or Disinfection or both were neglected; and 4, in the 58 outbreaks in which Isolation and Disinfection were both enforced. (Compiled in the office of the Secretary of the State Board of Health from reports made by local health officers.)



Diphtheria in Michigan in 1886, exhibiting the Average Numbers of Cases and Deaths per outbreak:- (1) in All the 461 outbreaks Reported, (2) in the 243 outbreaks in which it is Doubtful whether or not Disinfection or Isolation were secured, (3) in the 102 outbreaks in which Isolation or Disinfection or both were neglected, and (4) in the 116 outbreaks in which Isolation and Disinfection were both enforced. (Compiled in the office of the Secretary of the State Board of Health from reports made by local health officers.)



which will be sent from the office of the State Board to any person who wishes to receive and read them, so that, if any person fails to receive them this evening, a postal-card request addressed to the office of the State Board of Health at Lansing, will secure a copy of any one or of each of the several pamphlets which relate to the restriction and prevention of the dangerous communicable diseases.

CLOSING OF THE CONVENTION.

On motion of Dr. Ellis, a vote of thanks was extended to the Secretary and members of the State Board of Health, to those who had read papers before the convention, and especially to the secretary of the convention for his untiring efforts in making the convention a success.

Dr. Henry B. Baker, responded on behalf of the State Board, and moved a vote of thanks to the local committee which had charge of the convention. His motion prevailed.

President T. J. Ramsdell then closed the convention, and said: When we think over, digest and assimilate the truths learned during these two days, we will find this one of the most valuable conventions ever held in the city. To those who are not here I must say "You have made a mistake."

I trust that another convention will be held in our city, and I can say to the members of the State Board of Health, whenever you are willing to come again, we will be glad to see you.

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PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

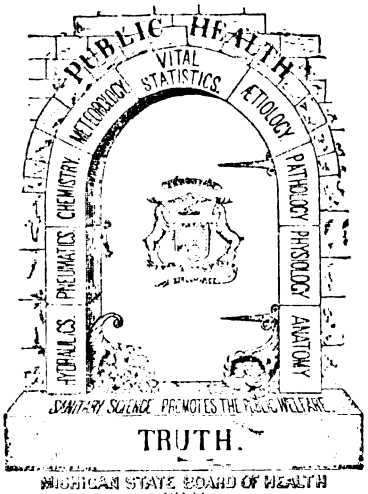
HASTINGS, MICHIGAN,

DEC. 3 AND 4, 1888.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF HASTINGS.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1889.]

No. 294.



MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
DARIUS D. THORP, STATE PRINTER AND BINDER.
1889.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

HASTINGS, DEC. 3 AND 4, 1888.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1889.

Darius D. Thorp, State Printer and Binder, Lansing.

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

"*Resolved*, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein."

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT HASTINGS, MICH., DECEMBER 3 AND 4, 1888.

SUPPLEMENT TO REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1889.

This Convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Hastings, acting with a committee of the State Board of Health.

The following named persons constituted the local committee: Hon. Daniel Striker, Chairman; Hon. Jas. L. Wilkins, Mayor of the city; Dr. D. E. Fuller, City Physician; W. L. Wilkins, Dr. A. P. Drake, C. W. Warner, City Recorder, Sec'y of Committee.

The committee from the State Board of Health consisted of Henry B. Baker, M. D., of Lansing.

The officers of the convention were: President, Hon. D. R. Cook.

Vice Presidents: Hon. Clement Smith, Hastings; William H. Young, M. D., Nashville; S. C. Rich, M. D., Middleville; Eugene Davenport, Woodland; Norman Latham, Baltimore; H. F. Peckham, M. D., Freeport; A. C. Towne, Milo; Prof. J. W. Roberts, Hastings; Secretary, A. E. Kenaston, Hastings.

First Session — December 3, at 2:30 P. M.

The convention was called to order in the Court House by Hon. D. R. Cook, president of the convention. After prayer by Rev. William M. Puffer, Hon. John Avery, M. D., president of the State board of health, Greenville, spoke concerning the objects of the convention substantially as follows:

STATEMENT OF OBJECTS OF CONVENTION.

BY HON. JOHN AVERY, M. D., PRESIDENT OF THE STATE BOARD OF HEALTH, OF GREENVILLE.

I am glad to meet so many here, and in giving a statement of the objects of the convention, I suppose that many of you are as well aware of the objects to be attained as I. It is that we may awaken an interest in the community in regard to subjects pertaining to the health of communities and individuals. The time was when disease was regarded as a providential

affliction sent for our good or to punish us. Through a better knowledge of the causation of disease we have come to learn that one-third of all sickness is due to preventable causes. So far as relates to our own interest it is necessary that we ascertain what these preventable causes are and how best to prevent them.

The object of these conventions is to awaken interest, and we have found where these conventions have been held a nucleus of good influence has been formed. In Michigan, communities are now endeavoring to prevent as well as to cure disease. When we consider the amount of sickness in every community, and that every case entails expense and loss of time which is money, we must see that if we can prevent any portion of this sickness in that proportion we benefit the community pecuniarily as well as in the prevention of suffering.

Looking over the reports of the State board of health you will see that the most common diseases are scarlet fever, diphtheria, whooping-cough, typhoid fever, small-pox and measles,—all preventable. There ought not to be a case of any of these diseases in Michigan, and if the interest of communities was properly excited there would be very few cases indeed. Though there are hundreds every year, we are glad to know that a better feeling has been awakened, and when these diseases do occur, they are now fenced in and not allowed to spread. This is particularly true of small-pox, as to which there is everywhere a wholesome fear. If it were known that a man in this room were broken out with small-pox, it would be impossible to keep us here half an hour, but how would it be with diphtheria? Many would remain, yet diphtheria is more contagious than small-pox and more people die with it every year. People haven't the same wholesome fear of it, and it is this fear we wish to excite. Gentlemen have come here from a distance to discuss these questions with you, and from the character of the audience I judge that the convention will be a profitable one and that a nucleus of good influence will be formed.

PRESIDENT'S ADDRESS.

BY HON. D. R. COOK, OF HASTINGS.

LADIES AND GENTLEMEN—As this convention has been called for the purpose of discussing questions of much importance to us all, I know that I shall receive your hearty approval when I say that we fully appreciate the kindness and consideration that the State board of health has manifested in our behalf, and the interest that these honorable gentlemen feel in our welfare, to meet with us, and give us the benefit of their experience, obtained by lives devoted to study and observation, so that we may be enabled to walk in the pathway of health and happiness, guided by the light of their wise counsel and instruction.

They come to us in the spirit of genuine philanthropy, without fee or reward, save only that reward which the generous and noble heart always feels, when prompted by the thought that it is more blessed to give than to receive. Let us remember that he, who, forgetting his own comfort and happiness,

steps aside to take his fellow man by the hand, and lead him to health and happiness, is a public benefactor, a friend of his race, and deserves the undying gratitude of mankind.

The ills of life, I am inclined to think, come to us from our ignorance largely, our lack of observation and experience. The subtle, silent forces of nature have been to us in a large measure a sealed book, into which we were not permitted to make scientific explorations for the use and benefit of mankind in this life, for fear that we might be meddling with the designs of Providence, and thus be liable to lose our hold on the life to come. But that dark night of ignorance and superstition has passed, and we are beholding the dawn of a better day, the sunlight of reason and science has at last arisen and is breaking through the dark clouds, and today no field is considered too sacred for human thought to enter and investigate. The grand army of scientific athletes is entering, taking possession, and fast driving out the lurking foes of man's happiness and well-being.

We have a detachment of that grand army with us today, and we shall make a wise choice, if we follow their instruction, heed their advice, and order our lives governed in all things by reason and experience rather than a blind faith in some mysterious providential power, which we would fain make the scape-goat for infirmities caused by our own violations of nature's laws. I often wonder whether we are not thinking too little of the happiness of this life, and too much of the golden harps of another! Let us learn how to live, and then we shall know how to die. And as we progress in our knowledge of causes and effects we shall realize the importance to us of gatherings of this kind, showing to us that what we need is more good advice and less medicine. The medical fraternity today, I believe, are agreed, "that the ounce of prevention is worth more than the pound of cure;" and as you will see by the program, it is the prevention they are to discuss for our benefit.

When we reflect that we live by the food we eat, the water we drink, and the air we breathe, we see how very important it is that these fundamentals of human life be taken as pure as possible into our system, and it is to aid us in so doing that this convention is called and these questions discussed. We trust and feel assured that we shall greatly profit by them, unless, like the one of old, we look and behold ourselves in the glass, and then go away, straightway forgetting what manner of men we were.

We, as a people, have paid too little attention to the laws of health! The race for wealth and the rush of improvement has crowded into our national life of a century the work of a thousand years of many other nations. This Yankee nation, as Fanny Fern once said, go it on the steam principle, "beat or bust." And when we see the rapidity with which we are "busting," we are beginning to see the necessity of ordering a halt, stopping for a moment to think whether, after all, it is not better to have a little less wealth and more good health; but, as wealth is a powerful stimulant in everything, I want to call your attention to the economic question that suggests itself, which you may not have considered.

We have with us today some of the best medical talent of our State, who have called to visit us, and prescribe for us, and will go away without presenting a bill; a new experience to most of us, I think, and a new departure from the usual practice of the profession, and still another very pleasant reflection that we have none of their medicine to take.

The subjects for discussion during this convention should enlist the interest, and cause the attendance of all who can consistently be present, that our meetings may be pleasant and profitable as well.

I want to say, in closing, that we may all derive much benefit from these conventions, if we shall render practical the lessons taught, and let us not forget to reciprocate, as far as we may be able, to those who have so kindly volunteered to help us make the journey of life pleasant and happy, by leading us into the paths of good health.

As this is our pioneer meeting, and this my pioneer effort before such a body of medical talent and ability, I scarcely know whether, as president, I have said too much or too little, yet from some recent experience and observation I think that presidents can say too much sometimes.

I feel very much like the boy who had moved into a new district, on his first day at school. The teacher was questioning him to know how far he was advanced, in order to place him in the right class, and asked him the following question: "Now, John, if you should stand with your face to the west, would your right or left hand be to the north?" "Well," says John, after thinking some time, "you see I can't answer that question now, 'cause I haint bin in this neighborhood only a little while." But, taking the risk, I will not further trespass on the time of the convention, knowing that the intelligent instructions to be imparted are waiting to be heard by listening ears, and will simply say to you, gentlemen, that I know your listeners are intelligent enough to fully appreciate your efforts and be greatly benefited by them, and for them I give you an earnest and hearty welcome to our city, hoping that your visit may be as pleasant to you as I believe it will be profitable to us.

Henry F. Lyster, M. D., member of the State Board of Health, then gave an unwritten address on "The Degenerations of Age," of which the following is a reporter's abstract:

THE DEGENERATIONS OF AGE.

REPORTER'S ABSTRACT OF AN UNWRITTEN ADDRESS BY PROF. HENRY F. LYSTER, M. D., MEMBER OF THE STATE BOARD OF HEALTH, DETROIT.

The degenerations of age belong to those diseases where an ounce of prevention is worth a pound of cure, only the prevention must begin early enough. They do not belong to those diseases which are caused by a microbe. The degenerations known to physicists and doctors are spoken of as albuminoid, fatty, mucoid and colloid, parenchymatous, calcareous, pigmentary and fibroid. But I wish to speak of the larger results of these degenerations.

Life is an unceasing battle with external forces during the whole period of its existence. Sooner or later it comes to an end in death. Death is the cessation of vital change. Life is action. Death is rest. Life may be divided into periods of growth, of maturity, of decline. During the period of growth there is more than the necessary vitality, more acquisition of strength than is necessary for the day. During maturity there is more of an equal balance between decline and repair. During the next period the repair is not equal to the decline. Degeneration of tissue is felt here. Changes occur in the

respiratory system, the circulatory system and the nervous system. The decline among males occurs at about the age of 55 or 60, among women it is a little earlier. During this decline there are changes in the physical tissues and anatomy. The diseases of the respiratory system include influenza, bronchitis, pneumonia, enphysema. A large majority of elderly persons die in winter. In severe winters the oldest inhabitant is always dying from lung diseases, usually pneumonia. The chest in old persons is more solidified, it is not as active and the lungs are not as fully inflated. The air cells of the lungs are enlarged. The blood does not circulate as well because the air does not circulate as well. The blood does not get as much oxygen and is not as pure, hence fatty degenerations occur. Venous blood is retained in the lungs, and hence elderly persons are more liable to inflammations. Preservation of life may be greatly enhanced by taking care of old people, seeing that they are provided with flannels, rubbers and overcoats when there are changes in the weather. If the primary cold could be avoided, much suffering could be avoided.

Among diseases of the circulatory system may be mentioned heart disease, blood clot and calcareous degenerations. These degenerations are apt to occur in the delicate arteries of the brain, and apoplexy results. In the nervous system, the brain shrinks in weight and blood; cerebral degenerations and mental diseases occur.

The small-pox cycle is about five years in length. The present year is one in which we have to fear the maximum prevalence of small-pox in our State. Asiatic cholera comes in a period of 17 years, but there are more deaths every year among elderly people by exposure to cold than in any year by the advent of Asiatic cholera.

In this connection should be mentioned hereditary strains. Dr. Rush noticed some time ago that octogenarians usually had an octogenarian father or mother. It is rare that a man lives to an advanced age whose father and mother died young. We notice this a good deal in life insurance examinations. Many people come up comparatively easy to 54 years of age, in fact they are never sick, but it is impossible to troll them along afterward. Others go creaking along like a barn door on a rusty hinge, complaining of dyspepsia, etc., and yet they live right on. This is the hereditary strain which physicians recognize. Certain vitality comes down with the strain. We live, very generally, to the longevity of our ancestors unless we emigrate to a new climate. The Germans and Irish who come here do not live to their fatherland longevity. So the early pioneers who came to Michigan were brought into a life not as good as the life they left behind in New York. Now we are a State with a history of our own. Life was comparatively a short life in Michigan until recently. We have here the descendants of those Huguenots who were driven out of France under Louis XIV to Belgium and Holland. So we have here the descendants of those Puritans who braved hardships for freedom of religious thought. From this strain of excellence we get much of that decision of character shown by our best citizens.

There is no class of diseases where the axiom that "an ounce of prevention is worth a pound of cure" is more applicable than here. What are we to do with the person who reaches fifty years with a constitution ruined by excess—a victim of chronic inebriety. His lecture should have been received 30 years ago. We can only use him as a text. If the lecture is received in

early life, if moderation in living is practiced and correct habits are formed, these degenerations will be largely prevented.

Five hundred octogenarians in New England have recently responded to questions from the New York Tribune, and it has been found that they were active men who ate early breakfasts and three regular meals a day. If we paid more attention to our digestive system, ate proper food, not too much, not too little, and not too fast, we could put off the degenerations of age. We would witness more such declines as that of Dr. Holmes, the Charles Lamb of America, now 85 or 86 years old, and Mr. Bancroft, the eminent historian, now an active octogenarian, with all their faculties of mind unimpaired.

The great struggle for wealth which is indicative of American life,—our disposition to rush things, brings on these degenerations earlier with us than among sedentary people.

While the young should heed this lesson of "an ounce of prevention," the decline and death of living beings are as definite in their occurrence as their growth and development, and I have particularly spoken of this subject at this time in the hope that in the coming winter you may take more pains to ward off those dangers to elderly people, that we may not forget the preservation of health of those in the decline of life.

PREVENTION OF DISEASES OF THE EYE AND EAR.

BY G. W. LOWRY, M. D., OF HASTINGS.

This subject being chosen for me, I shall not attempt to discuss any fine spun theories in reference to it, but to give practical advice, as far as possible, in the twenty minutes allotted for this paper. I desire to give useful instruction to the community at large rather than to fire up a discussion by physicians.

A humorist once said: "A wise man will take care of his good health, but a fool will attempt to do the same after his good health is lost." No one can appreciate the blessings of good vision and hearing so well as those who once have enjoyed and afterward been deprived of them.

It is quite common for parents, when they see the eyes of their infant inflamed, swollen and discharging muco-purulent matter, to commence using domestic remedies, which at times, if used rightly, will do good, but unfortunately this is seldom the case. As the child grows worse and worse they multiply their remedies, as advised by friends and neighbors, until precious time has been lost and the little sufferer is doomed, let its life be long or short, to grope its way through the world in darkness and gloom. This destructive eye disease, peculiar to very young children, is known to physicians by that jaw-breaking name, ophthalmia-neonatorium. It is curable when rightly treated, before too great destruction has been done to the globe of the eye. Mothers should ever be on the alert and see that the child's eyes are kept clean, and they should not lose any time, when the eyes show signs of this dreadful disease, in calling for competent treatment at once.

Some years ago I was called to see a very pretty babe, which had suffered from the disease in question, the eyes being past all help or prospect of ever being restored to usefulness. When I gave the mother such an unfavorable

prognosis, I shall never forget the grief she expressed. This sad result was the outcome of trusting too much to nurses' prescriptions and neighbors' "sure cures for sore eyes." That child's vision could in all probability have been preserved by scientific treatment that is commanded by every skillful physician. When we consider the sad prospects at best of a blind child, well may we ask, "Were it not better had this child never been born?"

Physicians should instruct that the eyes of the new born child should be washed or cleansed and dried before washing or cleansing the body, and as the child grows older a little soap and clean pure water is necessary to keep the face, hands and body clear from all offensive matter that may find its way into the eyes. I pity the mother who is so poor that she cannot afford a piece of soap, a rag and plenty of clean water. These articles are necessary after as well as during childhood, and if they were used a little more freely physicians would not have so many eyes to prescribe for.

Diseases of the edges of the eye lids called "marginal blepharitis," diseases of the eye ball called "phlectenular ophthalmia," and ulcerations of the cornea, not infrequently are caused by want of cleanliness. Wash the children's dirty hands and save them from washing them with their tears when crying, and rubbing poisonous dirt into their eyes that may be plastered on their hands during times of their innocent plays.

Another great source of danger is the articles of amusement children are allowed to play with, e. g., sticks, stones, sharp tools and explosives. It is a common thing for physicians to see little patients with the loss of an eye from these causes. We see eyes destroyed by being struck with a stone thrown by a playmate, cut open by the point of a knife or sharp point of a file or scissors, or pierced by an exploded gun cap, etc. Children need almost constant care and teaching, and a little pains taken with children in preventing accidents and diseases of their eyes, saves them for a life of usefulness and the parents from much sorrow and pain.

An eye destroyed by accident or disease is often a source of great danger to its fellow, more especially when it remains irritable and sore or becomes so periodically. The two eyes are held in such intimate relation to each other by nervous filaments and fibers, that if one becomes injured or inflamed the other is liable to become affected sympathetically. Sympathetic ophthalmia, after becoming thoroughly established, is seldom if ever arrested. This disease may commence in the well eye after injury or destruction of sight by disease of the other eye anywhere from three weeks to fifty years. The late eminent oculist of Cincinnati, Dr. Williams, cites a case where a small shot was carried in one eye for fifty years, after which time it caused sympathetic ophthalmia in the other eye by which it was lost. Not long since, an active, well to do day laborer came to my office from an adjoining county; on examination I found the sight of one eye had been lost, by having been pierced by the tine of a pitchfork, twenty-five years prior to this time. It never gave him any great trouble nor affected the other eye for twenty-four years; after which time it became inflamed and painful, and had continued so more or less of the time since. Soon after the blind eye became irritable, dimness of vision was noticed in the well eye, and at the time of my consultation, sympathetic ophthalmia was progressing rapidly. I not being able to give the poor fellow any degree of encouragement, he retuned to his home. A few months after, on inquiry, I learned that he was entirely blind, and was sobbing out a miserable existence in the county poor-house. When an eye is injured,

badly (especially when sight is lost) and continues irritable and inflamed in spite of treatment, as is likely to be the case with those eyes that contain foreign bodies, such as pieces of steel or gun caps, they ought to be enucleated, —removed as the only safety for the well eye.

I could multiply these illustrative cases and would like to say much more to impress the great importance of this subject on the minds of my hearers; but I must pass on, considering that "a word to the wise is sufficient."

Some children, from various causes, become squint eyed (more commonly called cross eyed); when this is the case and one eye fixes on objects more than the other, vision in the two eyes becomes unequal, the one eye gradually losing its power from non use. If such eyes cannot be corrected of their malposition by medicinal or mechanical means, they should be remedied by surgical interference. Parents who will let their children grow up with this deformity of eyes, whereby vision is forever crippled, ought to be educated differently. They justly deserve the criticisms, often given, by such children when they are grown to think for themselves. When it is necessary to perform an operation for cross eyes, it should be done while the patient is young. The deformity alone is sufficient cause for the operation, besides the greater necessity of preserving binocular vision.

In order to prevent children from becoming squint eyed, objects of amusements should be large enough to be seen easily at a distance; and small objects that require an extra effort to discern and which necessitate bringing them into close proximity to the eyes, should, as far as possible, be avoided; the same rule applies to near sightedness, called myopia, to which I shall next direct attention. The principal cause of this error of refraction is a strain of accommodation, objects or print being too fine and indistinct, the light being poor with bad reflection. We find the number of myopes increases as we go from the lower to the higher classes in schools, and this corresponds to the increase in the number of working hours. One writer gives statistics as follows:

"Among scholars occupied two hours per day 17 per cent of myopes; among scholars occupied four hours per day 29 per cent of myopes; among scholars occupied six hours per day 40 per cent of myopes."

Near vision may in various ways provoke the production and favor the progress of myopia in eyes predisposed to it.

In the great majority of cases near work is done while the one performing it is in a sitting posture, the body being inclined forward and the head bent over the object looked at. Such a position interferes with the circulation; the thoracic and abdominal organs suffer from it, digestion is interfered with, the extremeties become cold and the head congested. If this active and passive hyperemia has troublesome consequences for the most robust constitutions, it certainly becomes deleterious for eyes already disposed to myopia.

Bad arrangement of seats and tables, the excessive fineness of certain kinds of work, engraving, embroidery, fine stitching and reading of two fine print, lack of clearness of the object, due to a faulty typography, pale ink and poor paper, all tend to cause myopia. The great surgeon, Prof. Esmarch, says: "School children become myopic owing to the bent position of the body when they are seated on badly constructed old fashioned benches. The trunk is bent when the bench is too far from the desk, when the former is too low relatively to the latter, or when it is without a back. So seats are

inoffensive only when the child can sit upright on them while reading and writing and can keep this position long at a time without fatigue.

In order that this requirement may be met it is necessary: 1. That the bench be raised above the floor, the length of the child's legs, (measured from the popliteal space to the sole of the foot). 2. It ought to be as broad as the thighs are long (the distance from the popliteal space to the back). 3. The front rounded edge of the bench ought to project two or three centimeters beyond the inner edge of the table. 4. The seat should be sufficiently high so that the child can, when writing, conveniently rest the forearms on the table, without raising the shoulders and without bending the neck or leaning forward. 5. The lower part of the child's back should be properly supported when the scholar is reading by means of a short chair back. These conditions vary with the growth of the child, and the above measurements should be repeated and the scholars assigned suitable seats at least as often as once in six months."

Books to be read and paper to be written on should be placed on an inclined plane to avoid the near approach of objects of fixation, producing and maintaining congestion of the face. The light should be sufficient so that the smallest print can be seen by the average good eye, at a distance of twelve inches. The light should come nearly over the shoulder, a little to one side, so that neither the body nor the hands may cast a shadow on the reading. The bright glare of the sun should not be directly reflected into the eye.

Sunlight that God gives us every day is far the best light for the good of our eyes, and like air should be used freely. Window shades and awnings should be used only to protect the eyes from injury by the direct rays of the sun, but not so as to shut out the proper amount of light necessary for the easy discernment of small print by ordinary eyes.

Myopia calls for careful treatment as regards the manner in which such eyes should be used and the remedies for the disease, including proper correcting lenses.

Myopia has a tendency to become malignant. It may at any time cause a disease in the posterior wall of the eye, called "scleretasia posterior," which often destroys the usefulness of the eye. While at rest, myopic eyes can only focus divergent rays of light on the retina; under the same conditions, hyperopic or far-sighted eyes can only focus convergent rays. In correcting these errors of refraction we should place a lens before the hyperopic eye that will correct both the manifest and latent hyperopia.

The myope should wear lenses that do not fully correct the apparent, scarcely such as correct the real, myopia.

The geatest care should always be exercised in prescribing spectacles, and more especially for the young. Improper lenses are apt to do harm or increase rather than decrease the errors of refraction.

It is of the utmost importance that parents and teachers should see that children's eyes are in proper condition to perform the work required of them. Errors of refraction should be remedied by spectacles or otherwise without reference to age.

Let it be borne in mind that eye lotions will not cure refractive errors; that alum curd, poultices of fresh beef and rotten apples will not cure a purulent ophthalmia; a Thompson's eye water or Petit's eye salve will not cure disease of the retina nor optic neuritis, nor coperas water an abcess of the

lacrymal sac; atropia will not cure glaucoma and eserine is dangerous in iritis; sugar of lead will leave a stain in ulcers of the cornea, and crystals of alum and sulphate of copper may break the ulcers through into the humors of the eye.

To prevent ear diseases as well as those of the eye, is to avoid as far as possible the cause. The ear may become diseased from exposure to drafts of cold winds, from taking cold in the head, acute and chronic catarrh, picking the ear with instruments, such as the head of a pin, hair pin, ear scoop, etc. The ear drum may become injured or broken through by very sharp loud noises, such as are produced by the firing of a cannon. This can be avoided by having the mouth open at the time of the explosion, so that the disturbed air may strike the ear drum on both sides at the same time, that is by way of the external ear and through the throat and eustachian tube. Another way to prevent the injury from this cause is to place a little cotton wool into the external ear, which will break the force of sound on the ear drum.

"Sound is produced when one body strikes another, the air being thereby thrown more or less violently into waves, in proportion to the power by which the bodies come together. These waves strike upon the ear drum, which in turn vibrates and sends the motion along the chain of bones in the middle ear to the fluids of the labyrinth. Here the wondrous harp of the cochlea, catching up the pulsations, carries them to the fibres of the auditory nerve, which conveys them to the brain, where the sound is recorded."

It is only when sound is too sharp and forcible that harm is done to the ear. Permanent injury is done by slapping the ears with the hand, driving the air with a degree of force sufficient to rupture the drum membrane. Kissing one in the ear is fraught with the same danger."

Scarlet fever, measles, diphtheria and typhoid fever play a prominent part in causing ear diseases. Catarrhal inflammations may work through the nose, into the throat, thence through the eustachian tube into the middle ear, sooner or later causing loss of hearing. The middle ear may become inflamed from taking cold and suppurate, the pus burrowing through the ear-drum, thus making what is generally known as a running or discharging ear, with little if any tendency to heal without proper treatment; or the pus may find its way into the cells in the mastoid bone behind the ear, causing a dangerous disease of the same, or the pus may find its way through the minute openings that lead from the ear to the brain and cause a severe meningitis or abscess of the brain, thus ending the life of the sufferer.

My belief is that many persons die of brain disease in this way, the prime cause of which is entirely overlooked by superficial observers. It is the physician's duty to search out these causes and explain and educate the people that suppuration is not only dangerous to the ear but to life. Parents make sad mistakes in neglecting to have such ears cured, instead of letting their children trust to nature or unskillful treatment. Recently a young lady came to my office to consult me about her ears, which had been suppurating for 17 years, her hearing so far lost, she was obliged to lose her schooling. Her mother had similar ear trouble when she was a child, and old dame nature, having more compassion on her than her offspring, cured the disease. So the mother waited and waited, year after year, for the old mistress to cure the daughter's ears, but she did not. She escaped death, but did not escape the disadvantages brought about by this loathsome disease, and the loss of all the best part of her life for receiving an education.

The ears should be accustomed to all moderate changes of winter weather and care should be taken not to do too much bundling around them or the throat.

Foreign bodies in the ear are a source of danger, not so much from their presence, but rather from too much hurry about removing them. I have seen ears greatly injured and hearing lost, by forceps being introduced into them, fishing after real or imaginary foreign bodies. The ear is too delicate an organ to stand much gouging. When syringing the ear with clean, quite warm water will not remove these intruders, competent help should be sought before great harm is done. Foreign bodies often will do the ear little harm if left for weeks.

Ear-aches should be treated by hot water injections, not too long continued nor too often repeated; oils and sticky preparations should not be put into the ear; they are apt to form nests for the hatching of parasites.

The eyes and ears are the most important organs of the body. On these organs depend the education, the cultivation of mind and body, and the usefulness of a whole lifetime. These organs cannot be too highly appreciated. When young myopes and hyperopes are seen wearing correcting spectacles, when benches and desks are better fitted for the schools and counting room, when the light and pure air which Providence has given us are used more freely, when more time is allowed for recreation, out-door exercise and nourishment, so that food may not be taken in a hurry and digestion interfered with, then a healthier state of affairs will spring into life; errors of refraction and diseases of the eye and ear will be lessened and education advanced.

DISCUSSION.

Prof. Victor C. Vaughan, M. D., member of the State Board of Health, being called upon, said that there were many points of interest in both the papers which had been read. Very few people kill themselves by overwork, and a great many kill themselves by idleness. More people are killed by worry than by real work. How can we do our best work and yet be true to ourselves—preserve our health? The answer is: Let us vary our work, let us take proper recreation. The American people have not yet learned this. Our asylums are largely filled with farmers' wives. Why? There is no other class of people so isolated, with so little recreation. We are not made to be hermits. In Berlin we may see every Sunday twenty-five to fifty thousand people in the zoological gardens. Two bands supply music, and during the time that I was there I never heard a loud or rude word; it is simply enjoyment; they know how to take their recreation. If it were here somebody would be drunk. I don't know what it is. It may be the climate, but it is largely due to the restraining influence of the better classes.

We should also take rest in sleep. The amount of sleep should be in proportion to the intensity of the work. When I first began the practice of medicine I was surprised that farmers should suffer so much from diseases caused by imperfect supply of oxygen. I afterwards learned that it was because of imperfect ventilation of the sleeping rooms. In the olden time the men who had the most muscle were the best men. In Greece the highest offices were given to the best athletes. We still struggle for existence, but by means of the brain. But muscle and brain should be symmetrically developed. We should get as much out of life as possible, and to do this we should aim to have a sound mind in a sound body.

The points in the second paper are well taken. We get all our enjoyment and learning through the senses. We should guard against near-sightedness and other diseases affecting the eyes in school and at home. How often we see children gathered around the table at night studying from one imperfect light. I believe that more cases of myopea are contracted at home than in schools.

Dr. G. W. Lowry said, in response to a question whether or not the thorough use of soap might not be injurious to the eyes of children: In my reference to soap I did not intend to instruct that we should scrub infants as we would a door knob. Children, like delicate house plants, should be

handled carefully. A nurse that is so careless as to fill a child's eyes with irritant soap should not be allowed to bathe nor be trusted to care for them. I agree with Dr. Vaughan, that many, if not most cases of myopia, are contracted at home.

Second Session—Monday, December 3, at 7:30 P. M.

The convention was called to order by the president, after which Prof. Victor C. Vaughan, M. D. Ph. D., member of the State Board of Health of Ann Arbor, gave an unwritten address on "The Duty of the State in Investigating the Cause and Preventing the Spread of Disease." This was followed by the following address, by A. Arnold Clark, of Lansing, on "The Germ Army—How it may be Routed."

THE GERM ARMY—HOW IT MAY BE ROUTED.

BY A. ARNOLD CLARK, LANSING, MICH.

It is a favorite notion of modern physiologists that the human body is a sort of body politic,—a commonwealth inhabited by an immense multitude of living cells. It is almost impossible not to think of these cells as reasoning beings, as we find each struggling for its own existence but dependent on its neighbors and working with them in the common object of building up the tissues of the body,—turning food into muscle and nerve.

In the midst of this "busy whirl of industry," these cells are constantly changing, giving birth to new cells, dying, and the human body, like the great world we inhabit, is the constant theatre of birth and death.

These invisible cells have their invisible enemies; these enemies are popularly called germs. When these germs of disease gain an entrance to this citadel—the human body—through the air we breathe or the water we drink, they commence what Virchow calls a "struggle" with these cells, and we very properly speak of an "attack" of disease.

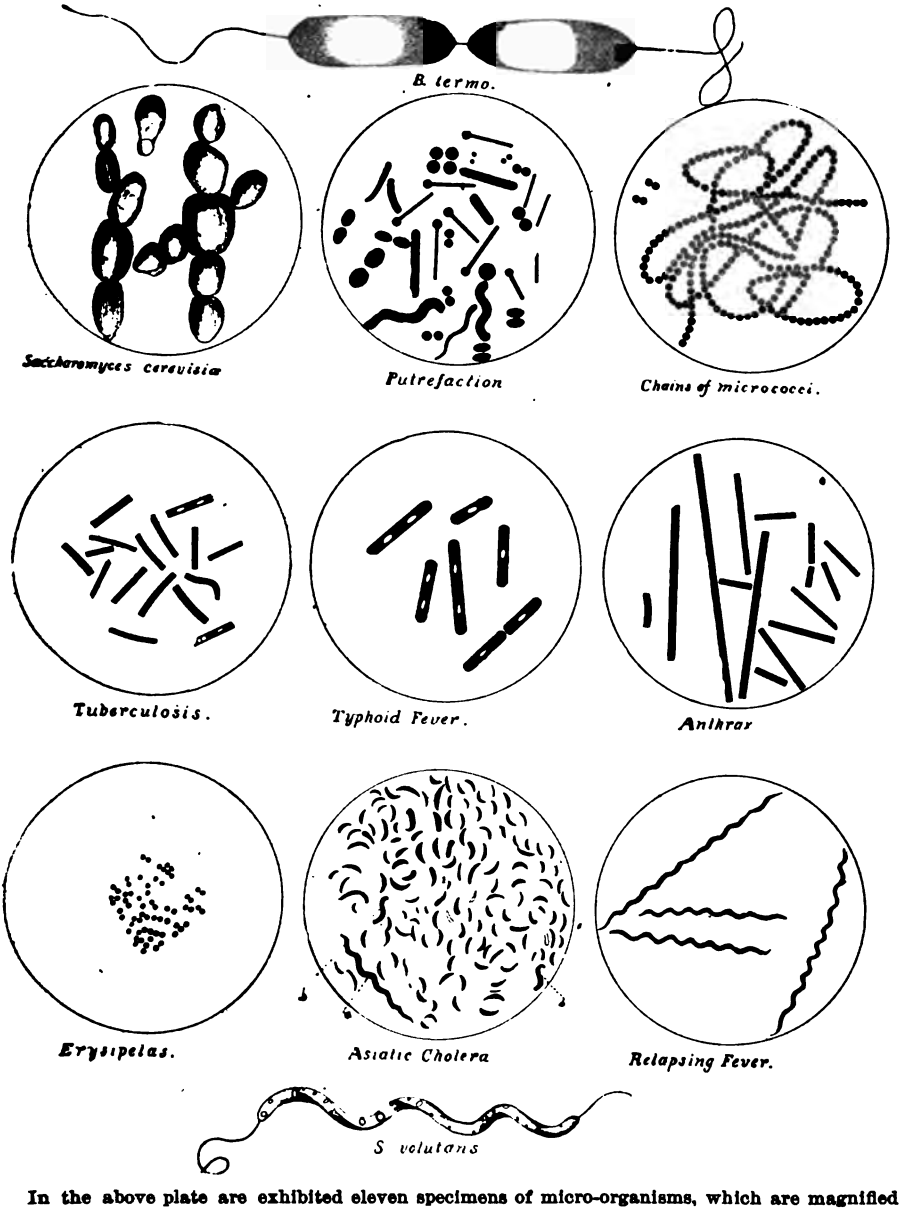
Vivid pictures have been drawn of this battle, how sometimes the germ is destroyed by the cell, how sometimes it conquers the cell, bursts it open and rushes to destroy other cells. Perhaps it might be more accurate to speak of the germs breaking up the body compounds into poisons, each germ producing its own peculiar poison,—its own peculiar symptoms, so that a sick man is like a city that has been sacked, plundered and debauched by a foreign soldiery, all the healthy avenues of circulation blockaded and clogged.

Without entering into an intricate explanation of how these germs produce disease in the human body, it is enough to say that where the vital forces of the human body are stronger than the germs, we have what is called a light attack. At times we have for a while a drawn battle, then the citadel is re-built from its ashes. When on the other hand these little soldiers of the Great Destroyer win a complete victory, the citadel is taken, the body dies, and we realize the truth of Victor Hugo's words: "It is with the infinitely little that the infinitely great conquers us."

NON-PATHOGENIC GERMS.

Not all of these "infinitely little" germs are the enemy of man. We have to thank them for our daily bread, our vinegar and our beer. In the accom-

panying diagram you will notice a picture of the yeast plant. This is the great brewer which turns our barley into beer and our grape juice into wine. As it is impossible to tell at a distance whether an army is friendly or hostile, without a field glass, so it is necessary to magnify all of these pictures. When I tell you that the germs in these diagrams are magnified many thousand times, you will see how "enormously small" they are.



In the above plate are exhibited eleven specimens of micro-organisms, which are magnified approximately, as follows:

Bacterium Termo, * about	2000	diameters.
Saccharomyces Cerevisiae (Yeast), about	500	"
Putrefaction (Bacteria) † about	1200	"
Chains of Micrococci, ‡ about	1400	"
Tuberculosis (Bacillus), about	1100	"
Typhoid Fever (Bacillus), † about	1100	"
Anthrax (Bacillus), † about	1400	"
Erysipelas (Micrococci) † about	1300	"
Asiatic Cholera, † about	800	"
Relapsing Fever (Spirillum), † about	1300	"
Spirillum Volutans * about	500	"

* "Bacteria," by Dr. Antoine Magnin and George M. Sternberg, M. D., F. R. S., p. 40.
† "Microscopical Technology," Dr. Carl Friedlaender. Frontispiece.
‡ The Practitioner (London), Vol. XXXII, p. 261.

The ancients, unable to understand the wonderful process of fermentation, knowing quite well that it could be no mere chemical process, spoke quite reasonably of the "spirit of wine." "O thou invisible spirit of wine! if there is no other name by which I may call thee, then I will call thee,"—sacharomyces vini. When you ladies can your fruit you know that by boiling it and keeping out the air, it will not ferment. You have kept out the germs of fermentation floating in the air.

In the same way that this yeast plant turns our grape juice into wine, this bacterium termo (see first figure in the plate) turns sweet meat into carrion, and these comma-shaped germs here (near bottom of plate) make a well man sick with Asiatic cholera.

RAPID MULTIPLICATION OF GERMS.

But how, you ask, can so few germs as may find an entrance into your fruit on one exposure to the air, produce this dreadful havoc of fermentation? How can so few germs as are sometimes carried in a letter cause such dreadful outbreaks of disease? The answer lies in the rapid multiplication of these germs.

There are two ways in which germs reproduce. Usually one germ lengthens out and divides, producing two. Sometimes a bright oval spore or seed is formed in the germ, the germ is broken and the new germ is formed. This spore is the egg of a new germ. Think of an organism not so large as the point of a pin laying an egg!

In the rapid multiplication of these germs there is a good chance for a play of the imagination. Cohn saw the bacillus subtilis divide every 20 minutes. Assuming that each germ divides into two only once each hour, then in two hours four will be formed, in three hours, eight; in four hours, 16; in five hours, 32; in six hours, 64, or at the close of 24 hours at this rate, there would be seventeen million descendants of one germ. Or in five days at this rate, the descendants of a single germ would, says Cohn, fill all the oceans of the earth, and yet they are so small that if drawn up in battle array millions of them may be crowded into a cubic inch. And though they are so light that Tyndall saw them dancing in the sunbeam, yet Cohn estimates that in five days the descendants of one germ would weigh 15,000,000 pounds. Of course germs do not multiply this fast, because they lack the food and for other reasons, but it is only when we understand their power of rapid reproduction that we can understand those great epidemics which sometimes take great cities by storm and even depopulate nations.

It is this rapid multiplication which proves these germs to be living matter. You can dilute strychnine and make it harmless,—it don't reproduce. You can't dilute the yeast plant because it does reproduce. "A little leaven leavens the whole lump." I haven't time to mention the many experiments by which it has been proved that these germs do not develop spontaneously, that each reproduces after its own kind. When you can keep the germs of fermentation out of your fruit,

THEY DO NOT DEVELOP SPONTANEOUSLY IN THE CAN,

and the fruit does not ferment. So the germs of scarlet fever no more arise in the air out of nothing than birds do. It was formerly thought that animals developed spontaneously. Von Helmont gave a formula for the spontaneous production of mice: "Take a dirty shirt, put into it some grains of wheat, subject the whole to heat, and at the end of a certain time there will be a transmutation of the wheat into mice." People used to think that the ooze of the Nile turned into eels. So when contagious diseases were first studied it was claimed that they developed *de novo*. Scarlet fever and diphtheria were attributed to dirty surroundings, and when this wouldn't work, to the "will of God." All this is a thing of the past. A field full of thistles is an indication that the seeds of thistles have been wafted there, and as you can't gather figs from thistles, you can't get diphtheria from anything but diphtheria. There was no scarlet fever in this country until the germs of scarlet fever were brought to this country 150 years ago from a previous case, and if the germs of scarlet fever were all destroyed to-night, scarlet fever would be again a disease unknown. Diphtheria no more arises from the smell of decaying vegetables than bees are generated by the smell of decaying meat, as Virgil believed. Bad smelling marshes no more give birth to typhoid fever than to snakes and frogs, as the ancients thought. You can no more spontaneously generate a case of glanders than you can the horse that has it.

Koch has given a series of rules which must be followed before it can be said that any given germ has caused a given disease. The germ must be found in the blood or diseased tissues of the person sick; it must be isolated and cultivated and injected in some animal producing the symptoms of the disease, and it must again be found in the diseased tissues of the animal.

This has been done in some diseases, and the germs thus studied are pictured in the accompanying diagram. Before referring to them in detail I should say that there is almost an

INFINITE VARIETY OF GERMS.

Without attempting any scientific classification, I may say briefly that there are three forms most usually met with, (1) those round like a ball (called micrococci), (2) those long like a lead pencil (called bacilli), and (3) those shaped like a corkscrew, called spirilla. In the process of division, they form chains and swarms. They shape themselves into columns, platoons, phalanxes, squares, and go through as many evolutions as our best trained military troops. They form colonies which are visible to the naked eye though the individual germs are not. You can see an army at a distance where you can not see a soldier.

The largest of these germs is the *spirillum volutans*, which is one three-hundredths of an inch long,—quite a giant.

Many of these bacilli and spirilla have flagella or cilia by which they move about. You will notice these threads in the bacterium termo and spirillum volutans in the accompanying diagram. They are as much smaller than the germ as the lion's tail is smaller than the lion.

Cohn, describing moveable bacteria, said that swarming in a drop of water they looked like an ant hill. Swimming forward, they stop and without turning around dart suddenly backward, thus forward and back as if executing the movements of a quadrille. Remaining motionless a long time, they dart suddenly forward "like an arrow," "spin around like a top" and swim like a fish. It is almost impossible not to think of them as possessed of consciousness and having a good time. Dr. Kedzie describing a drop of water full of bacteria, said that it looked like an "animated skating rink."

MANY DIFFERENT SPECIES LIVE TOGETHER.

A few weeks ago the Scientific American printed pictures of 71 different varieties of bacteria found in a glass of beer. About eighteen different species exist normally on the teeth. You will notice some of the bacteria usually found in the saliva in one of the figures in the accompanying diagram. Man's mouth is a regular botanical garden.

Experiments made with the books in the circulating libraries of Dresden show that where the leaves of the book are turned with the dry finger, not many germs are found on microscopical examination, but where the finger is wet many germs are found. All of these happened to be non-pathogenic germs, but if a child sick with scarlet fever had been reading that book, the disease might have been spread in that way.

Experiments show that the coins and paper currency of Germany are covered with bacteria. In more senses than one it is "filthy lucre." Perhaps your child is carrying in its mouth the penny that has been paid out by a diphtheritic patient.

The germs of consumption have been found in the dried fly specks on the walls of rooms inhabited by consumptive patients,—the flies had eaten the sputa. It is also claimed that the germs of typhoid fever have been carried in this way.

These germs find an entrance to the body through the water we drink and the air we breathe. They abound in crowded rooms. It is these germs, as Tyndall showed, which enable us to see the sunbeam dancing in a darkened room. When people go into a crowded room and breathe through the open mouth these germs find a ready entrance to the lungs. When you breathe through the nose the germs may be stopped by the moist nasal passages. Probably a good many people might avoid catching some contagious disease by keeping their mouths shut.

The higher up you go the less the number of germs. Some one has facetiously suggested balloons as a health resort. Between one and two hundred miles out at sea very few germs are to be found, and sea breezes coming over this distance are comparatively free from germs.

Experiments show them to be more abundant in the cities of London and Paris than in the suburbs and more abundant in the suburbs than in the country.

I have thus spoken of germs in general because

THOSE GERMS WHICH ARE HOSTILE TO US

come to us in the same manner and under the same guise as our friends. From town to town they go like a conquering army, but unseen. They are the uninvited guests at our banquets, they sparkle in the water we drink, greet us in the letters of our absent friends, and from the person of the pauper infect the millionaire.

We can see the different military tactics of these different germs when we reflect how these germs of erysipelas (referring to diagram) attack only the surface, the germs of cholera the intestines, the germs of scarlet fever come from the flesh dry, those of diphtheria must be dried before they attack us, while those of typhoid fever enter the body wet, just as they come from the infected body.

Without referring at length to the action of the different germs pictured in the diagram, I may illustrate by telling a story. A year ago a man sick with typhoid fever went from a railroad construction camp to the city of Iron Mountain, Mich. In a few days he died. The dejections of this patient were not disinfected as they should have been, and the germs found their way into the water-supply of Iron Mountain, and there were 350 cases of typhoid fever and 35 deaths. The water-supply of Iron Mountain literally swarmed with this foreign army of typhoid germs. A jug of the water used by some of the families sick with the fever was sent to Prof. Vaughan of the University. He inoculated a sterilized meat preparation with this water, and this injected in dogs produced a regular run of typhoid fever the same as in man, the germs of the disease being found in the intestines after death. The existence of this germ was also proved by microscopal examination and by the potato culture. Here are 35 deaths because of neglect to properly kill the germs which came from the first case. Many other outbreaks might be cited where hundreds of cases have resulted from one.

Not all diseases have been as thoroughly studied as typhoid, and yet we know that they are caused by a specific germ which reproduces after its own kind. In this connection let me tell you another story: Two or three years ago a Pullman car conductor came in contact with the germs of small-pox in his car near Chicago—passed through on the Grand Trunk to Montreal, and was taken sick with the disease. No pains were taken to kill the germs, the ignorant inhabitants refused to vaccinate, declaring it a "wicked attempt to thwart the will of the Almighty," and in a few months over 3,000 people in Montreal died of small-pox as a result of the one case.

It was carried to different parts of the United States; Michigan, the most exposed of any State, escaped because Michigan had at her great ports inspectors of travel who vaccinated all who came through and disinfected all clothing, thus killing the germs.

Every week reports are received at the office of the State Board of Health, where outbreaks of diphtheria and scarlet fever have been traced, beyond a doubt, to the germs from a previous case, from letters or clothing. In 1874 there was a case of scarlet fever in a house near Laingsburg. The curtains that hung in the room, the doll with which the child played and some other articles were packed away in the garret. Five or six years later another family moved into the house and cleaned out the garret. Part of the stuff was burned, but the girl took the doll with which the sick child played, and

the two boys took the pictures. In ten days the three children were sick with scarlet fever.

These little invisible enemies of man understand military maneuvers of which the Napoleons of the world never dreamed. They find a hiding place in our garrets and our wells, lurk in the rubbish of our cellars, linger in our hair and clothing, cling to our beds, our carpets and our walls, are brought to us long distances by letters from our friends,—more ingenious than the famous Greek horse, they steal in with the family cat and come with the flies. They congregate in poorly ventilated churches, greet us in the kisses of our friends and from the coffin of the mother attack the cradle of the babe.

HOW TO DESTROY THE GERMS.

At last science has begun to see that there is a nobler course than to wait for an attack of these germs and hope that they may be repulsed. The medical profession has sent along its picket line of health officers into the enemy's camp. All honor to those who stay behind to care for the wounded, but aggressive action must take the place of defensive action, prevention must take the place of cure. When we have found a germ we must find its germicide. We must kill these germs before they attack us. It is easier. You have probably heard of the Irishman who swallowed a potato bug and then swallowed Paris Green to kill it. That is like trying to blow up a foreign army after it has entered our gates.

What shall we do to be saved from these germs? There are many interesting questions in this connection which I have not time to discuss. For example, it has been thought by some that these germs can be made to destroy each other. It is known that there are some germs that are not dangerous to man which eat up germs that are dangerous. The germs of typhoid fever grow faster in water in which there are no other bacteria. Koch found that the cholera bacillus would not thrive in beer,—it was destroyed by the other germs. Now some have fancied that every hostile germ has its enemy which is innocent to man, and that sanitarians may yet make use of these friendly germs.

VACCINATION.

Neither have I time to speak of the great hopes for vaccination in the future. The principle of military strategy here involved is not to attack the germs but to strengthen our own fortifications against attack. It is well known that one attack of a disease usually fortifies our body against future attack. Whether the first army forages and devours the food necessary for the support of that kind of germ (Pasteur), or leaves behind some chemical products in which none of their kind can live (Klein and Klebs), or whether, as some claim, the cells have been educated by the first attack so that they better understand the military tactics of this hostile tribe, and thus acquire vital resisting power (Sternberg), it is enough to know that a conflict with the weak members of one of these malignant tribes fortifies our bodies just the same as a conflict with the most malignant. Now we can weaken these germs, introduce them into our bodies, they are easily conquered by the cells and we are vaccinated. The germs don't lose their nature at all. As some one has said, the rattle-

snake has not been changed into a frog,—we have simply extracted some of its poison fangs.

BOIL THE DRINKING WATER.

Against those diseases which cause the most deaths in Michigan there is a practical remedy in the hands of every man. I told you how that dread disease, typhoid fever, which kills a thousand citizens of Michigan each year —mostly those in the prime of life—is spread by the germs in the water we drink. Now what will destroy these germs? Freezing the water will not do it, but boiling the water will do it. Robert Elsmere preached a good religion when he preached the necessity of boiling all drinking water. Nothing so easy, nothing so potent. Filtering the water will not destroy these germs. It only takes them prisoners, and when the prison is overcrowded, the filter itself becomes a distributor of germs. Boiling the water one-half hour will destroy them. In view of this fact, someone has declared every death from typhoid fever to be suicide or homicide, and if there is any one thing I would emphasize tonight, and have remembered when I have done, it is this simple precaution: Boil the water; boil it when typhoid fever is prevalent; boil it at the time of year when typhoid is expected; boil it if you have any suspicions about your well; boil it anyway. You will hear many precepts at this convention, some, perhaps, which you will forget, but I shall be satisfied if the enthusiasm of this convention reaches the boiling point.

The germs of these other diseases, diphtheria and scarlet fever, enter the lungs through the air we breathe. What will destroy these germs? You may have heard of many disinfectants, but experience in this State has proved that the

FUMES OF BURNING SULPHUR WILL DESTROY THESE GERMS.

You will find it demonstrated in the reports of the Michigan State board of health that during the last two years hundreds of lives have been saved by isolating those sick with diphtheria and scarlet fever, and then, after death or recovery, burning sulphur to destroy the army of germs hiding in the house. Sulphur has long been a good orthodox disinfectant for the next world; we now know that it destroys the little devils in this.

It was an old idea that disease was caused by the possession of devils, and that the way to cure disease was to cast these evil spirits out. Our forefathers used to prick the affected part in the hopes of thus letting the evil spirit out, in much the same way that the Indian medicine men now gather about a patient, one playing the tom tom to scare the devil out, another jumping on the patient's stomach to stamp the devil out. If the devil doesn't kill the patient the doctor usually does. Now disease is caused by the possession of evil spirits—devils, but, strange as it may sound, devils that can't live where sulphur is burning.

Such is the foe with which we have to deal. This army of disease germs is the "enemy at our gates." We spend thousands of dollars to maintain a large standing army to protect us against those foreign foes with whom we ought to be at peace. We pay our health officers about enough to keep them in sulphur and boiled water. But of our Michigan boys who enlisted in the Union army during the late war, disease carried off four times as many as the fields of battle and the wounds of battle. In the Crimean war 20,000 French soldiers died in battle, 75,000 died of disease. Those great plagues

of the middle ages which swept over Europe like the barbarous Huns and Tartars, caused more deaths in a single year than alll the wars of the century.

Like the human race, disease seems to have its home in the east and take its empire westward. Like an invading army, small-pox came to Germany in 1493; to America in 1527. The cholera germs first came here in 1832, and then died out—something like the French soldiers who were unable to endure the climate of Algiers. In India these germs do not die, and every year we fear an invasion. If all the forces of civilization could be gathered here, if once we could kill all the cholera germs in Calcutta, why shouldn't the future Crecy classify this among the fifteen decisive battles of history?

Too often we turn over our mortality statistics and read in the newspapers of so many deaths—such a place, with no other emotion than we experience while reading the market price of our products. But if, as Byron said, it is a

> "Dreadful thing to see the human soul take wing—
> In any form—or any way,"

it is sad to know that over one-fourth of all the deaths which occur in this State are from diseases which we know enough to prevent but do not. Not long ago in one of your neighboring towns there were six deaths from diphtheria in one family in one week, every one of which might have been prevented had every officer done his duty.

On the cars to this convention, whose object is to save human life—I thought of Dickens' beautiful description of the engine which carried away Mr. Dombey after the death of little Paul, and how to him that great iron monster, "defiant of all paths and dragging behind it human beings of all ages and classes, seemed like the type of the triumphant monster Death."

"Away with a shriek and a roar and a rattle—'mid objects close at hand and almost in the grasp—yet ever flying from the traveler," "with a shrill yell of exultation pausing for a minute where a crowd of faces are that in a minute more are not" "away with a shriek and a roar and a rattle, leaving no trace behind but dust and vapor—like as in the track of the remorseless monster Death!" "Away and still away—onward and onward ever, glimpses of cottage homes, mansions and rich estates that look deserted now as they are left behind, and what else are there but such glimpses in the track of the indomitable monster, Death!"

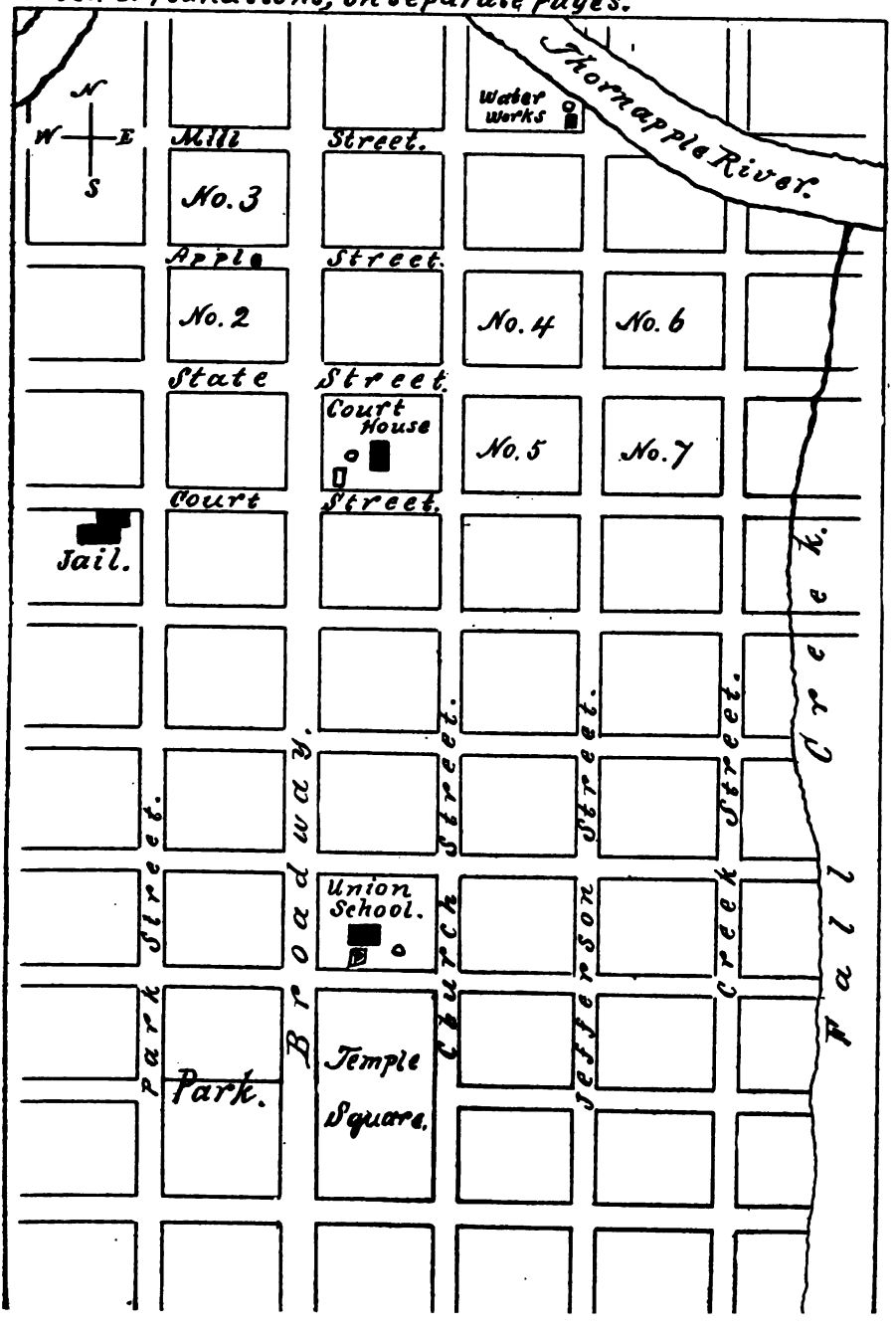
The duty of the State to prevent disease and death! Think of those who, in the prime of life, are ground beneath the iron wheel of this "remorseless monster!" Think of the young, the innocent, who are made wrecks for life! Think of a Proctor in the full brightness of his intellectual manhood, cut down by a disease which should be one of the accidents of civilization—and then say, if you will, that the saving of human life is not the first and highest duty of the State.

The discussion of this paper was led by Prof. Victor C. Vaughan, M. D., of Ann Arbor, member of the State Board of Health.

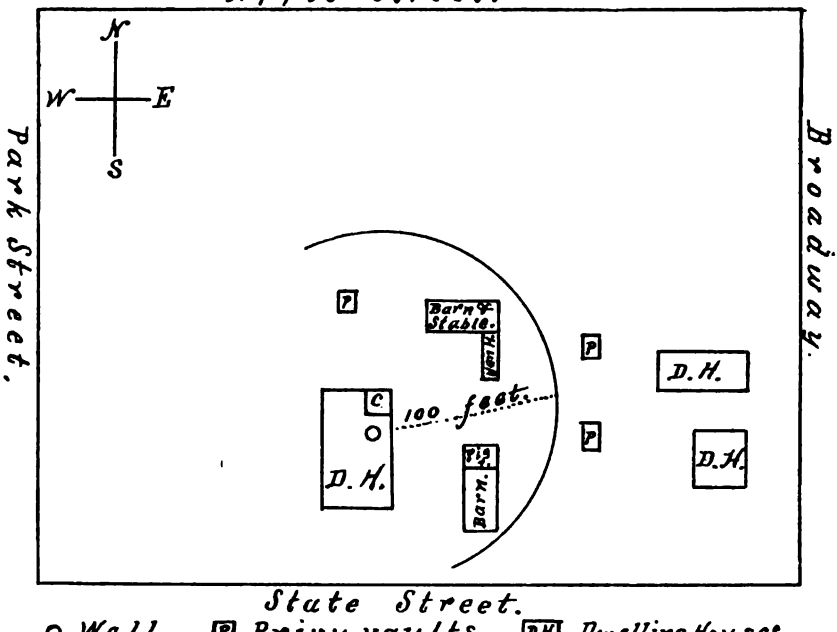
Third Session.—TUESDAY, DECEMBER 4, AT 10 A. M.

The convention was called to order by the president, after which prayer was offered by Rev. D. B. Ovlatt. Irving L. Cressy then presented plats of localities in Hastings, showing location of privies and wells, etc. The plats are as follows, the explanation of each being given below each plate:

Plat No. 1.—Part of the City of Hastings, showing location of blocks here numbered 2, 3, 4, 5 and 6, which are exhibited with explanations, on separate pages.



Plat No. 2.—Partial plat of a block in Hastings, Mich.

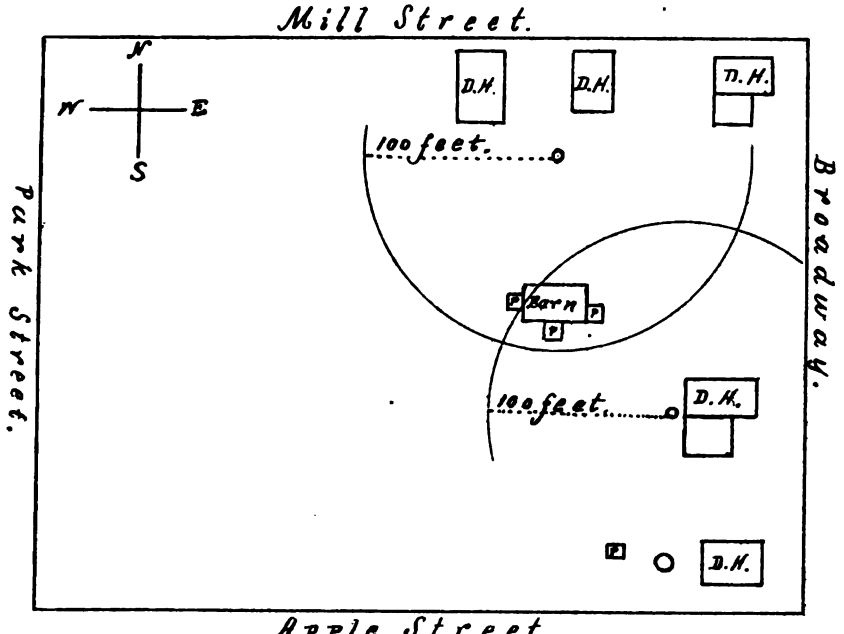


o Well. P Privy-vaults. D.H. Dwelling Houses.

A well (open) in the cellar; also an open cistern (marked C); A privy within 60 feet, north, and two, about 115 feet to the east; also a barn and stable, hen-house, barn and pig-pen. The well is about 12 feet deep. Here occurred several of the worst cases of diphtheria, four of which proved fatal, when it was so prevalent a few years since.

Reduced from a plat made by I. L. Cressy.

Plat No. 3.—Partial plat of a residence block in Hastings, Mich.

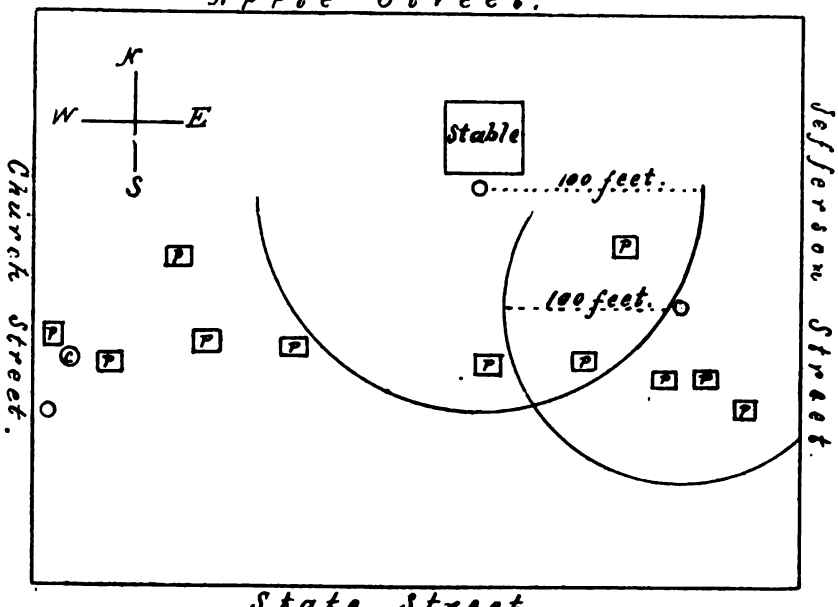


O Wells. P Privy-vaults. D.H. Dwelling Houses.

The well near the north side of the block is about 100 feet to the north of three privy-vaults. The well near the middle of the block has two privy-vaults within a radius of 100 feet. The wells are about 16 feet deep. The soil in this locality to the depth of 30 or 40 feet is composed of very loose gravel and sand, with an occasional patch of clay.

[Reduced from a plat made by I. L. Cressy.]

Plat No. 4.—A business block in Hastings, Mich.

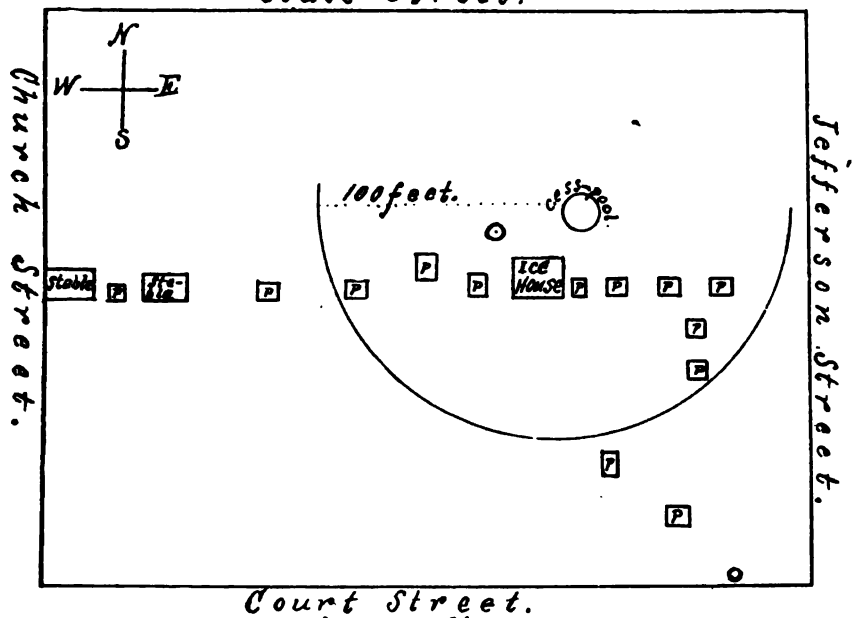


○ Wells. P Privy-vaults. ◎ Cess-pool.

This plat shows one well (next to the stable,) from which much water is taken in the summer for family use, and there are three privy-vaults within 100 feet. The other well on this Plat has five privy-vaults within a radius of 100 feet, and a great deal of water is used from this well in warm weather, but it has to be pumped out several times in the spring before it can be used. The well is about 18 feet deep.

(Reduced from a plat made by I. L. Cressy.)

Plat No. 5.—A business block in Hastings, Mich.

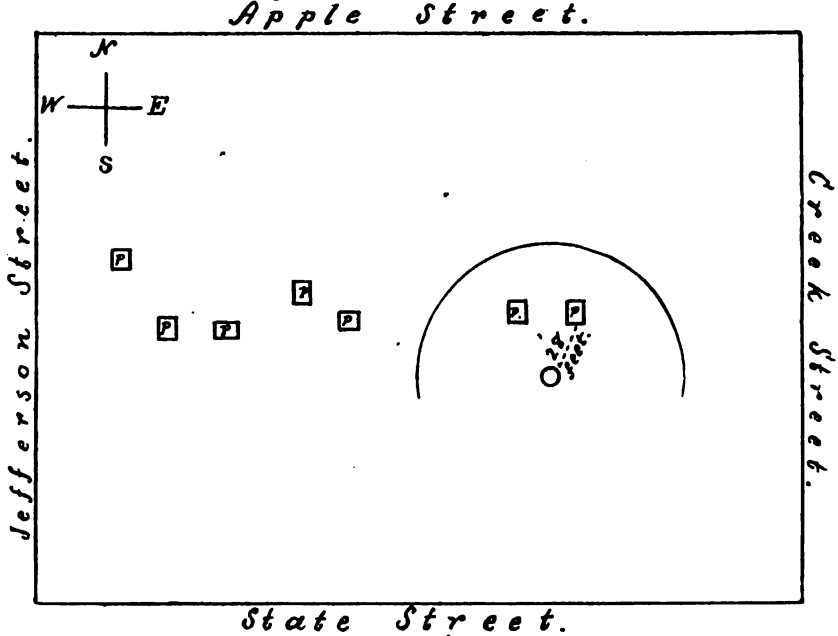


○ Wells. P Privy-vaults.

In this block there are nine privy-vaults within one hundred feet of a well; also a cess-pool into which all the washings and refuse from a meat market are thrown.

(Reduced from a plat made by I. L. Cressy.)

Plat No. 1.— Part of a business block in Hastings, Mich.



O Wells. P Privy-vaults.

This plat shows two privy-vaults within 30 feet of a well from which water is used, and when there were several cases of diphtheria. The well is about 14 feet deep. (Reduced from a plat made by I. L. Cressy.)

THE WATER-SUPPLY OF HASTINGS.

BY F. R. TIMMERMAN, M. D., OF HASTINGS.

Go with me if you please, along some roadside and watch the banks that have been cut down by plowshare and shovel. You will see lines of demarcation between sand, clay and gravel, dipping here and there, slanting this way and tipping that way, now distinct, now confused, or perhaps abruptly cut off. We will go again if you please, along the bank of some turbulent little brook after it has subsided from the effects of the spring rains. You will find sand, gravel, and decayed leaves piled up in a semi-stratified arrangement in lines of demarcation, tipping and dipping, now distinct, now confused,—in short, you have a miniature model of the hills that surround us, and so we believe them to have been formed.

Agassiz tells how, in ages past, the great glaciers came from the north with boulders fast clasped in icy fetters, which were scattered far and wide when the ice melted, and the great floods followed. The water supply of this particular locality was doubtless very abundant at that time. We have reason to believe it was so, for the city is built upon three terraces, which were undoubtedly formed by the Thornapple river, before it subsided to its present modest proportions. It was this great water supply of the past that laid the strata of the drift, formed the valley of the Thornapple and filled the 150 lakelets which lie 175 feet above us on the watershed between Kalamazoo and Thornapple rivers. The highest point is reached 17 miles south, by a little west, of the city. Numerous small streams from these lakelets are sent bubbling over beds of gravel to the Thornapple river. How many are sent percolating through beds of gravel in the strata of the drift beneath us, I leave for your consideration. The trend of the strata, and the course of the underground currents, so far as known south of the river, are principally from the south, those north of the river, from the north. Passing in a northeasterly direction, the summit of the divide between Grand river and Thornapple is found at a distance of five miles, where it reaches an altitude of 125 feet above the city. There is also a chain of small lakes upon this elevation, their outlet flowing southward into the river near the city. From the drift comes our water supply, the bed rock being so far down that we have not yet been able to find it. Now, much depends upon the arrangement of the strata of the drift as to quantity and quality of water. We have in this locality, for the first 30 or 40 feet, a stratum of very loose soil, composed of gravel and sand with an occasional patch of clay. With a surface of this character, and lakelets and streams upon every hand, can you doubt that our water supply is abundant? I assure you that nature has dealt kindly, and given us a bountiful supply of good, pure water. But have we kept it so? I think not. A soil that permits of free and rapid percolation of water will also transmit the emanations from a privy vault considerable distance, especially in the line of an underground current. I have prepared a sketch bearing upon this point, which I will shortly present for your consideration.

Very many wells have privy vaults within a radius of 75 and from that down to 20 feet, and cesspools can be found within a few feet of them. The wells of the city, with but few exceptions, receive their supply from the first vein of water which is found above the first great stratum of clay percolating through the lower portion of this thirty or forty feet of loose gravel and sand which extends to the surface. Thus we find things very favorable for contamination of the water from surface soakage, privy vaults, etc. The water from this vein is naturally good; it is clear as crystal, cool, pleasant to the taste, and is charged quite heavily with lime and a trace of iron. The wells are constructed in three different ways. By far the larger number are "drive wells;" next in order comes the tile well. Wells constructed in either of these methods are considered far superior to the old fashioned "dug wells," for their walls are impervious and water can only enter the tube at the bottom. Last, and thank heaven, least comes the dug well, stoned up with boulders from the field. This is by far the most dangerous, as surface drainage, sewage etc., find access to the tube of the well at any point.

Diagram 1.—A well in Hastings, Michigan; about 66 feet from three privies and a barn.

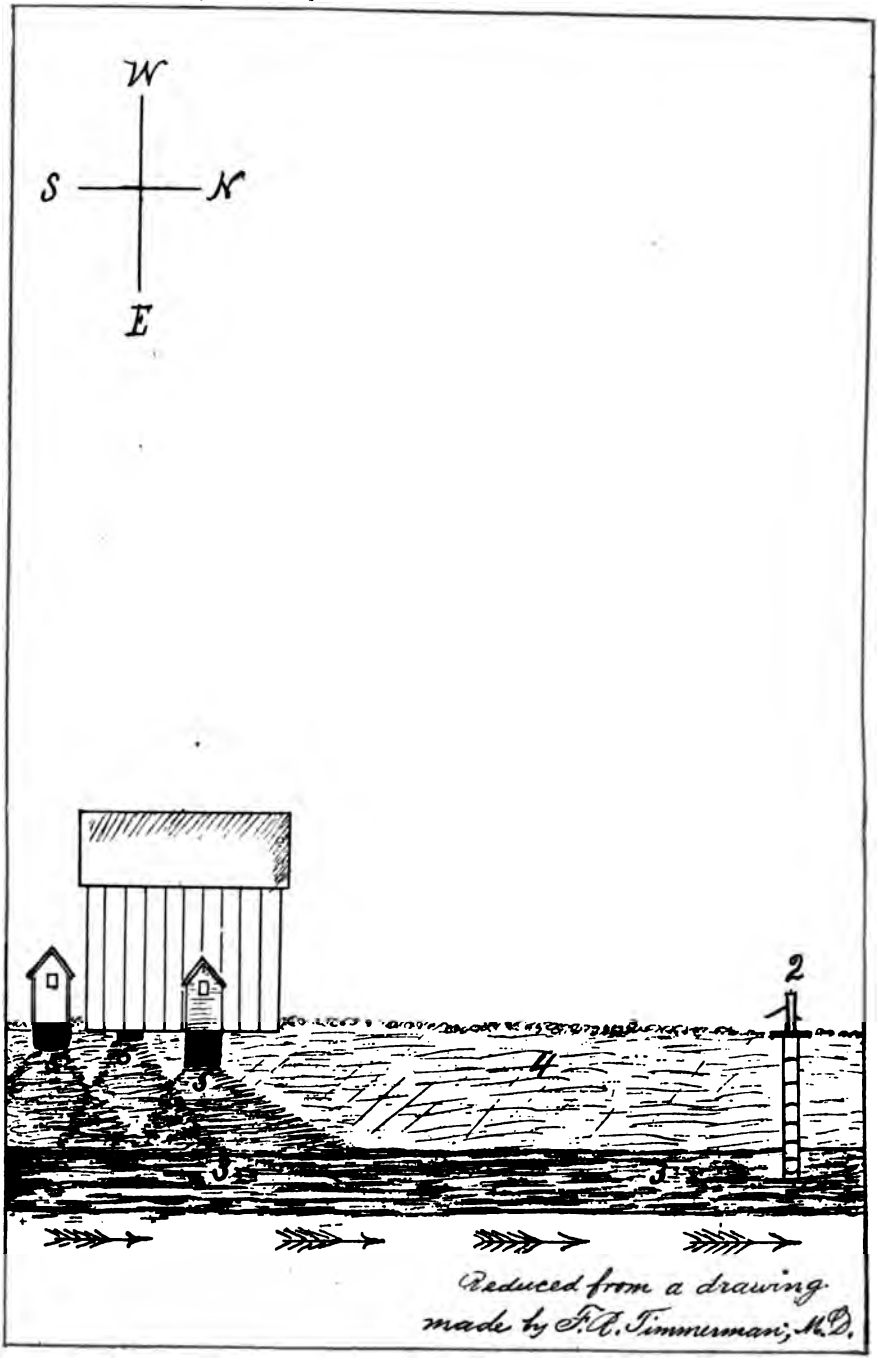
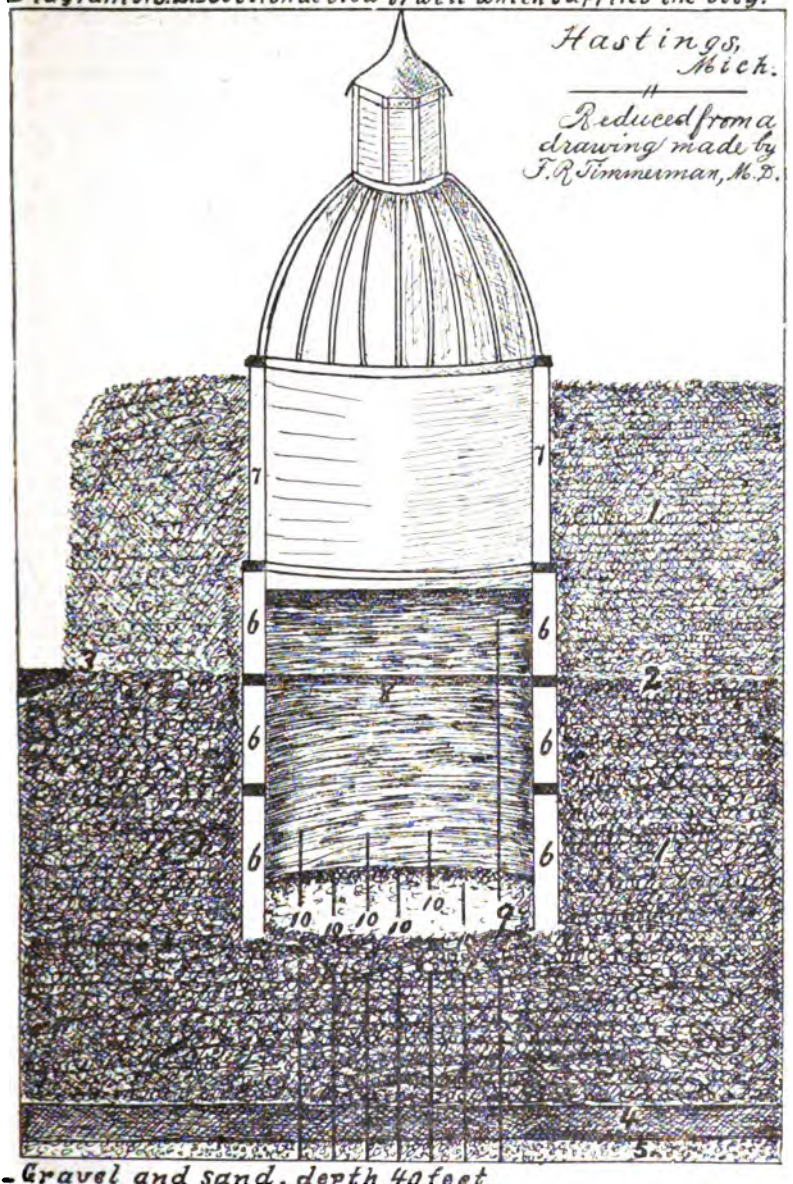


Diagram No. 2.—Sectional view of well which supplies the City.



1.—Gravel and sand, depth 40 feet.
2.—Upper surface of ground water, on a level with river.
3.—River, 75 feet distant from well.
4.—Clay 8 feet in thickness.
5.—Vein of water in very coarse gravel.
6.—Three sections of well, each 7 feet in hight; brick and cement, not perfectly water-tight. 7.—One section of well 9 feet in hight.
8.—First level of water in well. 9.—A two-inch pipe. 10.—Six three-inch pipes.

Diagram No. 1 is taken from a block located upon the lower terrace showing a tiled well (2) 14 feet deep which penetrates the first vein of water (3) 2 feet. There is no intervening clay stratum between the surface and the water supply of the well. Twelve feet of loose sand and gravel (4) is all the protection there is from surface contamination. Sixty-six feet south of the well is a group of three privies (5-5-5), one being on the opposite side of the barn, two of them in very bad condition. The barn, however, is not in use at present. Taking into consideration the fact, that the trend of the strata and the underground currents are towards the north, it is evident that there are very strong probabilities, to say the least, of contamination from this source. During the last two months, there has been prevalent in Hastings, an epidemic fever of a marked typhoid character. Three out of five persons who used water from the well just described had the fever. Water from this well, also from another well (where four out of six persons using the water had the fever) and from one of the city hydrants, were subjected to Heisch's test under like circumstances. The water from the city hydrant remained clear at the end of 48 hours, while the water from the two wells was decidedly cloudy and milky. This result but fulfills our expectations.

Diagram No. 2 is a sectional view of the well which supplies the city water works, showing its relation to the strata of the drift. From the surface to the depth of 40 feet is a stratum of gravel and sand (1). Fourteen feet from the surface this stratum is saturated with water (2), which is found to be on a level with the river (3). At a depth of 40 feet a stratum of clay (4) is found which is 8 feet in thickness; below this bed of clay is located the second vein of water percolating through very coarse gravel (5). There is a marked difference between this water and that from the first vein. The hardness of the water from the second vein seems to be largely due to magnesium, while from the first vein it is due to the calcium held in solution. The well is 20 feet in diameter, and was built in sections—three of them (6-6-6)—7 feet in height, while the fourth one (7) is 9 feet. These sections are built of brick and cement. It was sunk to a depth of 28 feet by excavating from the center. Water rose to a height of 14 feet in the well (8), which was found to be on a level with the river. Not being satisfied a two-inch pipe (9) was driven to the second vein. Water rose in the pipe 7 feet above that of the first vein standing in the well. Six three-inch pipes (10) were driven to the second vein; when these were allowed to flow, the water rose rapidly in the well, nearly 7 feet. Springs began to appear along the river bank, which was 75 feet distant, and the water in the well lowered about one foot. With the ordinary demand used to supply the city, and these springs still flowing, the water in the well remains at a depth of 19 feet and 4 inches, which is 5 feet and 4 inches above the height of the first vein and the surface of the river.

DISCUSSION.

Dr. John Avery, President of the State Board of Health, Greenville:—This paper cannot fail to be of great interest here. I hope that there are not many in your village who are relying on the use of well water. You can all see the liability of contamination of these wells, the larger proportion of which seem to end in the first stratum. In any thickly settled community like this, the soil has become polluted. I would advise every person to connect with the city water, though I would be better pleased if your city supply went clear to the clay and was a cement well,—impervious. In a direct tract pollution may go 500 feet, and no limit can be given as to the liability of your wells being contaminated by privies. It was asked yesterday, if typhoid fever comes from the drinking water, why do people in the country have so much typhoid fever? The reason is that in the country

no attention is paid to sewerage. The farmer builds his house and near the kitchen door or half way between the house and barn he digs his well. No provision is made for slops, which are allowed to filter into the soil. If germs are deposited on the soil they are likely to find their way into the well. The epidemic of typhoid fever which cost the village of Plymouth, Pa., so many lives and so much money last year was caused by the germs, from one man sick with the disease, getting into the water-supply. I am happy to say that this subject is daily engaging more and more attention and that pollution of the soil is coming to be looked upon as a crime.

Foster Pratt, M. D., of Kalamazoo:—The time will probably come when it will be desirable to put your well clear down to the clay. Even this lower stratum (extending under the whole city) may be contaminated. When you depend on a clay stratum for purity of water, you must know its length. Of course you exclude contamination from the immediate neighborhood. How slow people are to comprehend this relation of soil to health! People have a great deal of confidence in the old well, and Yankees are given to having things handy,—the well is handy and the privy vault is handy, and so in the course of time we find sickness and death to be terribly handy. The soil may be honeycombed with wells and privies and yet people can't be made to understand their danger until they learn it from bitter experience. You will find it difficult to get sewerage because your soil is a porous one. However, I hope that you will be as successful in solving the question of sewerage as you have been with your water-supply.

Henry B. Baker, M. D., Secretary of the State Board of Health, of Lansing: In studying the outbreak of typhoid fever at Plymouth, Pa., we see the difference between the contamination of the general water-supply and of a few wells. In the case mentioned by Dr. Timmerman, three cases of typhoid fever out of five drank water from one well. In Plymouth the contamination reached the general water-supply and there were over a thousand cases instead of five. Such an outbreak might occur here. Suppose that in case of fire your well is pumped so low that the surface water gets in and that at that time the surface water is contaminated with the germs of typhoid fever—in this way the public water-supply of Hastings might serve to convey this disease to all who drink of the water. This possibility enforces the necessity of making your well impervious to all water except that from a considerable depth.

DISPOSAL OF EXCRETA AND WASTE IN HASTINGS, BY SEWERAGE AND OTHERWISE.

BY A. P. DRAKE, M. D., HASTINGS, MICH.

We find from very early recorded history, that hygiene attracted the attention of the ancients, particularly that portion of hygiene relating to the disposal of excreta. But it is only within the last fifty years that sanitation has become a science. So far as we are able to observe, there is a constant effort on the part of nature to preserve an equilibrium of all its parts. What has become effete in one is taken up by another, regenerated, transposed and thrown off for the use of some other. So that the great laboratory of nature is continually at work cleaning and purifying itself.

The principal factors in this process as we observe them, are the four elements of the ancients—earth, air, fire and water.

The part assigned me for consideration in this paper is excreta. By excreta we mean that effete, worn out waste material of the system which is no longer of any use as a generator of force and stands in the same relation to the animal economy as the smoke, ashes and scoria to the furnace. If allowed to accumulate it becomes a source of poison to the individual, and when removed acts in the same way upon others.

What is the safest way for the disposal of this effete material, is a question for the most serious consideration.

In compact communities, where they are piled up several stories high, the water system is undoubtedly the best. But that requires a complete system of sewerage, and from the necessary expense in small associations is hardly practicable. In this place, as in all others of scattered population, an excavation in the earth has been the common mode. Sometimes the hole is walled, but generally not, and when too full for further use the building is removed and a little dirt is thrown in the old hole. And in many instances the refuse from the kitchen finds the same resting place. As there is a limit to the amount of purification in a certain amount of earth, there is no doubt that in much of the older portions of the city the ground must be nearly saturated and the surface wells contaminated, although as yet there has been no general outbreak of typhoid fever or other kindred disease to announce the fact.

Of late the dry earth system has been adopted by a number of our citizens but not in a manner to make it in any way universal.

Since the erection of our system of water-works, the water carriage system has been adopted by some for the removal of excreta, but it is only carried to a blind cess-pool near the residence, or if carried to a greater distance, to an opening above ground. To the cess-pool an open stand pipe is often erected to carry off the obnoxious gases. For a time this may be well enough, but, sooner or later, according to the porosity of the soil, the surface wells in the vicinity must become contaminated. For the sick room where the patient is able to use a seat, the dry earth commode is indispensable to the comfort of the patient and health and convenience of the attendants. If the bed-pan has to be used the discharges should be received into a strong solution of some powerful germicide.

With but little trouble and slight expense the same dry earth system can be applied to the privy, thereby rendering it as salubrious as any part of the premises. It was the dry earth system that enabled the camps of the great armies during the late unpleasantness to maintain such a high grade of sanitation. In small communities without a sewer system, dry earth is the most efficient and convenient system and accompanied with the least expense of any system known.

DISCUSSION.

Wm. H. Snyder, M. D., Hastings: The disposal of waste and excreta is a subject of the greatest importance in a sanitary point of view to the country and city and to every person living in the city The word waste suggests decay and decay suggests a want of cleanliness; and what is more offensive than filthy decaying vegetable or animal matter, not only offensive but injurious to health and life. It is difficult to define life, for we know not what it is, and this is a secret of all others that Nature will keep to herself. But the very existence of this mysterious essence, like the cause of heat, is known only by its effects. We know that for a time it endows matter with certain properties, such for example, as the power of self-preservation. It enables all living animals to resist, within certain range, the effects of noxious agents, arising from decaying matter.

There is reason to believe that one of the chief causes of fevers is a poison generated by the decomposition of organic matter and received into the body from without. To judge by its effects it seems to be widely diffused through the air in the neighborhood of sewers and putrid marshes, cesspools or filthy alleys. You are tempted to ask how it is, if poison is spread so broadcast, that everybody does not get sick with fever or some other miasmatic disease, why this person gets sick when you who are really more exposed, escape. But two things are necessary, not only the poison, but a person susceptible of being poisoned. It is only on a predisposed body that a morbid poison acts most. We are all constantly taking minute doses of poison from the noxious gases arising from decomposed matter, but can digest, oxydize it or render it harmless under ordinary circumstances. There was reason for this person being the victim while others escaped. Perhaps it was his rapid growth or being overtaxed with work. When the poison has once gained admission and is diffused

by means of the circulation through the system, its effect is to destroy the vitality of a considerable amount of the organic living matter with which it comes in contact. We may add that the poison is cognizable by the senses, so that a person very susceptible detects a difference as soon as he is brought into an atmosphere impregnated with it, that it will set up a putrefactive process in animal or vegetable matter. If distilled water, fresh animal flesh, or vegetable matter be placed under a glass and the air exhausted, no animal or vegetable growth will be found after a lapse of days, but admit the air and a multitude of microscopic forms will be developed in a few hours.

If the air we breathe is thus loaded with the larvæ of animal life and seeds of vegetable life we have no reason to doubt the doctrine of vegetable malaria. Although we must regard the epidemic influences in the atmosphere, yet disease is only propagated through persons or their excretions. The means of preventing this class of diseases may be enumerated as follows:

1. By the entire removal of the source of infection, as when a cesspool, drain or cellar is thoroughly cleaned and all animal matter is removed. 2. By the use of disinfectants which will destroy the disease germs. 3. By careful attention to the general health, which will enable the body to resist the action of the poison and cast it out when it has gained entrance.

The first is of the most importance and should receive attention. I have known instances where a neighborhood has been severely scourged with typhoid fever, when a few hours' work would have entirely removed the cause.

Arthur Hazlewood, M. D., Member of the State Board of Health, of Grand Rapids: In our small villages we have a remedy at hand in the bonfire. Everything from the kitchen can be burned without expense. In a great many houses the kitchen stove is so constructed that it can be utilized for the purpose, and no contamination of the soil is permissible. The solid part of our garbage should be burned where that is practicable.

Dr. John Avery, President of the State Board of Health, said, in answer to a question as to the best disinfectants for different purposes: After death or recovery from a dangerous communicable disease, the room in which there has been such a case, with all its contents, should be thoroughly disinfected by strong fumes of burning sulphur. For a room ten feet square, at least three pounds of sulphur should be used; for larger rooms proportionately increased quantities at the rate of three pounds for each one thousand cubic feet of air space. The contents of the privy should be disinfected with four ounces of the best quality of "chloride of lime" to each gallon of material in the vault. In typhoid fever it is especially important to disinfect the bowel discharges by thoroughly mixing with each discharge at least one ounce of chlorinated lime. Soiled clothing, towels, bed-linen, etc., on removal from the patient, should be placed in a pail or tub of boiling hot zinc solution, made in proportions as follows: Water, one gallon; sulphate of zinc, four ounces; common salt, two ounces.

SANITARY CEILINGS AND WALLS.

BY M. B. CHURCH, OF GRAND RAPIDS.

Much has been done by the sanitarians of the country, and especially the Board of Health of this State, to try to enlighten the people sufficiently in regard to the unsanitary nature of the prevailing modes of coating, or recoating and ornamenting the ceilings and walls of rooms for domestic habitation, yet much remains to be done in this direction. The reason is, no doubt, that those who strongly condemned the prevailing modes offered no relief, gave no way of any kind by which the people could even plainly cover their ceilings and walls. Prof. R. C. Kedzie in his lectures, when president of the State Board of Health some years ago, advised his audience to forego the pleasure of decorated walls, or to simply whitewash them with lime, rather than stop what he terms

"WALL RESPIRATION"

by sealing or strangling the pores in the plaster with paste and paper, kalsomine or paint. He illustrated to his audience by means of blow pipes filled with dried mortar and some coated with paper, others with paint and kalsomine, showing how readily air passes through walls of ordinary mortar, and with stucco finish (the so-called hard finish), or when simply whitewashed, and how this "wall respiration" was prevented by all the other modes; and under the professor's directions the State published a book entitled

"SHADOWS FROM THE WALLS OF DEATH,"

and placed copies of it in all the public libraries, with this bible inscription on its cover: "And behold if the plague be in the walls of the house with hollow streaks, greenish or reddish, then the priest shall go out of the house to the door of the house and shut up the house seven days. * * * And he shall cause the house to be scraped within round about, and they shall pour out the dust that they scrape off without the city into an unclean place."

This book contains 75 specimens of arsenical wall papers, all gathered from the paper stores of Michigan, and gives authenticated cases of poisoning from many of these papers, and on all of them arsenic was found in the

colors, not only green but nearly all colors and tints, and some, also, in making the finish or luster. A year or two ago the sanitarians of Massachusetts made quite an effort in this direction, introducing a bill in the legislature to prohibit the sale of such paper, but the paper men used their influence against it, sent representatives to the legislature, who claimed or pretended to prove that there was no foundation to the claims made by the sanitarians, and the bill was defeated.

Now, while there are many cases where the people have suffered from arsenical wall paper, I am fully satisfied from a thorough study of this subject of wall coatings, constantly for fifteen years, and quite a portion of the time applying the same, removing old papers and kalsomine, and from talking with sanitarians and scientists on the subject, that a greater amount of sickness is caused from other conditions of the walls and conditions that generally prevail, and in nearly every house, than from the very dangerous arsenical wall papers; and I believe in many of the cases cited, where it was proven that the patients had suffered in rooms coated with paper, which proved on examination to contain arsenic, that other conditions connected with the same paper and walls so contributed largely to the troubles.

Before going further I wish to explain that I will show, before the completion of this paper, how people may decorate their rooms in a way that is *approved of by the sanitarians*, who had before condemned everything used for the purpose, except lime whitewash. By the method I shall give and illustrate with specimens I have with me, I will show that walls can be ornamented with any degree of elaboration desired, or plain, and at much less expense, than with any of the old modes. The article has been sold for some years, and I find it in use by most of the sanitarians I talk with on this subject.

We will now consider the prevailing modes a little further. It is well known that most houses are papered, and that care has been taken in most cases to choose dark papers with many figures, for the same reason that a workman prefers a colored shirt, and I think I do not overstate when I say that seven-eighths of the buildings papered are papered more than once; that is, that two or more layers have been pasted on, one upon another, and that a large portion of these, say one-half of them at least, have from six to a dozen layers on. It seems as though people should only need to be reminded of this nasty practice, saying nothing about its effect upon health, to induce them to at least

REMOVE THE OLD COATS OF PAPER

and paste, after they have become filled with filth, before applying new coats. It is not necessary for me to explain, what every person knows, that flour paste will soon mold; that it is a ready absorbent of moisture and disease germs; also, that paper is a very ready absorbent; they may not be aware, however, that the coloring and bronzes, which are pulverized metals, brasses, etc., are only temporarily held upon the face of the paper with animal matter (glue) that soon decays, and glue is the greatest absorbent of moisture and the natural culture ground for the germs (so well pictured to us last evening by Mr. Clark), and if these little pests get sufficient heat while there they will flourish, and the rooms are sometimes very warm above the lines of the doors and windows with a moderate fire; and where repeated coats of this paste, paper and glue are

applied, from which outdoor air with its purifying effects is excluded, by the respirating pores being sealed or strangled, the danger is much greater.

The glue soon rots sufficiently to allow the air, or any friction, to remove small particles to which these germs have attached themselves to float about the room unseen, until they lodge in the system of some unsuspecting victim, whose physical condition is such that they take effect; then they still have the little particles of fertilizer with them to help give them a start on their deadly mission.

Dr. Henry B. Baker, Secretary of our State Board of Health, has shown us many different kinds of these little bacilli, some of which he had printed cuts of, taken from photographs. He explained how, by the aid of the latest improved microscopical instruments, it was possible to distinguish these pests, one from the other, those causing typhoid fever from those causing consumption, etc. (as shown on the canvass last evening), and explained how their growth can be watched, where they have been caught on bits of moistened glue; how they must come to a certain state of maturity before they are dangerous, and that they do not then take effect unless the lungs, or other parts of the body they strike, are in such a weakened or inflamed condition that nature cannot expel them.

The fact that these conditions do not always cause serious mischief, that some people do live in rooms, the walls of which are in a very unsanitary condition and, probably, filled with vermin, contagion and filth, without apparent or immediate injury to them, causes many to think that these claims made by the sanitarians are without foundation, or not of vital importance, while they, probably, suffer from these causes, more or less, which they attribute to having taken cold, or to having committed some impropriety in eating, or overwork, and when they become very sick they flee to another climate, if they are well to do, where they often recover, probably, by getting in a room not in so bad a condition, and return home to have the old trouble return, and continue to breathe this slow death dealing matter, to save the expense of removing the filth from the walls, or because they do not believe or have not heard the warning.

ANOTHER UNSANITARY PRACTICE

is what is known as kalsomining, which is the covering of ceilings and walls with coats of inert powders and colors, temporarily fastened to the wall with the same kind of animal matter used in coating wall papers. This glue coat also strangles the wall, but is not so bad as wall-paper, and seldom contains as much poison and does not admit of coating so many times, without falling off, though there is more glue in it, and it rots sooner, to be set afloat. Another bad practice is the painting of walls with oil paint, composed of lead, zinc and colors mixed with oils. This seals the pores of the walls more effectually than does the kalsomines or wall-paper, but remains longer before it decays sufficiently for small particles of the lead to be dislodged, though it always gives off a slight smell of paint, and when the room has been closed it always has a stuffy or stifled smell, something as do also all rooms covered with many layers of wall-paper The painted walls can be washed, but even if washed frequently the fine cracks always found in walls will be washed full of filth and the germs of disease if any in the room.

A SANITARY WALL COATING.

The article, or process, I have referred to as being adapted to making a clean, cheap and sanitary coat for walls, is composed mainly of sulphate of lime, known as gypsum, or alabaster, which has been calcined by subjecting it to great heat in retorts, or boiled in large kettles until its water of crystallization is driven off, so that when water is added to it again it will again take up its original water of crystallization. This process is called setting, and takes place naturally in about seven or eight minutes, re-forming a stone much like the original stone in the quarry, but more porous. This rock in the natural state, as we grind it at Grand Rapids, for use on farm crops, contains from 35 to 40 per cent of sulphuric acid. The better grades of this rock, after calcining, is so manipulated in making this article for walls, which is known as alabastine, that this setting process is retarded for a number of hours, adapting the plastic, or liquid, to being spread upon walls with a brush in a very thin condition, so that fifty coats as applied to walls from time to time form a hard, porous shell not thicker than card paper, and the coat is not of a glue or paste nature, the size and admixtures used to retard the setting having been absorbed by the base in taking up its water in setting.*

The late Richard A. Proctor explained in one of his last contributions to the Inter-Ocean how much moisture, in tons, would be thrown off by respiration from an audience of a certain size in a given number of hours. That this moisture is condensed, mainly on the walls of the room, is easily seen by rubbing the finger on almost any painted wall, where the moisture does not penetrate readily, but is on the surface, as is often seen on windows. This is sometimes seen on paper and kalsomine, but they absorb moisture so quickly that it does not show on the surface, though they attract more than the paint. That this moisture carries contamination with it is certain; also, that it rots such materials. The paint, as explained before, is not quickly rotted, but oxidizes slowly, so that the effect from it is not so bad as from paper or kalsomine. That

AIR PASSES THROUGH WALLS

is proven by the dust marks seen on plastered walls, or those that have been only whitewashed or alabastined, indicating the spaces between the lathing caused by the dust being filtered from the air more between the laths than on them.

It should be borne in mind that it is not claimed that the amount of air that will pass through walls, the pores of which have not been strangled, cuts any considerable figure in furnishing air to the inmates of the room, but that this purifying of the ceilings and walls takes place by the constant passing of pure air through and through them, oxidizing, or practically burning, these little germs, as it is well known pure air will do. In one of Prof. Kedzie's lectures he cites experiments made by Professors Marker and Shultz, in which they prove that a difference of 20 degrees in temperature on either side of a wall of brick and mortar, would cause 8 cubic feet of air to pass through each yard of such wall every hour.

*NOTE.—There is only one other article on the market that is claimed to produce the effects produced by Alabastine and that is called Anti-Kalsomine and plastico. These articles are made in many shades, ready for the brush, by adding water. Many kalsomines are put up and sold in the same form but are dependent on glue to hold them to the walls.

SPECIMENS OF THE SANITARY WALL COATING.

I have some samples here of the sanitary coating I have referred to, applied on panels, showing sections of quite elaborate designs, as well as plain work. I will explain them: This panel I now show you is finished mainly in what is called relief work. This corrugated work on the lower portion is done by applying the alabastine thick, then a coarse graining comb was drawn through it in various shapes, before it set. The colors having been ground in and chemically united, it forms a solid tint all the way through the mass, so that slight abrasions like cutting it off with a knife, still show the same color. Half of this combing has been varnished, which you see produces a somewhat darker and a satin or leather like effect; this varnished work is washable, and is as easily cleaned as any varnish. The center is simply bronze in the varnish. The upper portion, or decorated frieze, has less body on and was made by dipping each corner of a wide brush in the two different tints, which easily produced the blended or soft shaded effect. The ribbon was put on with a thin coat of the material through a paper stencil, and the vine in the same way. The flowers were put on with oil color. The other side has at the bottom what is called heavy stippling, and a slight representation of bas relief, that is sunk below the surface. The frieze above is ornamented in what is called flat relief, to imitate solid or high relief. The blended grounds of the frieze have been stippled, that is pounced with the ends of a brush or with a covered block to give it a slightly roughened effect. These effects are admitted, even by paper dealers, to be finer than it is possible to produce with the finest papers, and will make a blended tint, or whitened wall, on which borders, leaves, etc., can be applied with stencils and keep within bounds of the expense of papering.

Here we have a plain tinting on large sheets of paper with what is called a combination stencil border. The background of the border was put on with one paper stencil and the other, or main stencil, was used over it. This plain tint has the same stencil border on with one tint, which can be done as easily and as cheaply as the cheapest wall papering. Here we represent a wall blended from top to bottom in two shades. The manufacturers will show any painter, so that he can do this blending easily, and usually with one coat. This and the relief work is done with a late make of this material, made for this kind of work. When it is necessary to renew alabastine, you have no old paper or kalsomine to take off, but simply to repeat the process. I should add it will be seen, as this forms a stone cement that hardens with age, it precludes any possibility of the colors being liberated to float around the room, as they do from paper and kalsomine, even if they were poisonous. Some claim that a wall should be impervious, instead of porous. This might do very well with perfect ventilation, if it were possible to have such a wall, but one partially so is only strangled and gives a better chance for matter behind to ferment and the germs to propagate. Now, we show here sections of this work varnished, which is nearer impervious than any wall I have ever seen, as the varnish combines with the outer part of the porous stone surface by penetrating into it; also, there is nothing behind but the pure stone cement of a cold nature and the air has access to the back of the varnish, and there is absolutely no chance behind for fermentation or decay. However, for plain work, it is as well and as cheap in the end, without varnish, as it will stand some cleaning with care, to remove spots, and the surface can be re-

coated, almost as cheaply as the wall can be washed; then you have a choice of new tints, and any broken places in the plaster, which always occur, are filled and cemented by brushing on this cement again with a brush.

HOW TO REMOVE OLD WALL PAPER.

I will give directions for removing old paper, which though very simple, are not generally known. The process is easy, provided it is done each time a layer is applied, but if two or more are on, it is more difficult. First, wet a section of the old paper with cold, or tepid water, using a brush, and repeat the wetting until you see that the paper and paste is soaked through. when it can be pulled off, or if too tender, can be scraped with any instrument of a chisel form, shoved between the paper and the wall. Then the wall should be washed with clear water. To wet the wall ahead of the washing is also a help. Then, if when it is removed, you wish to repeat the process, your walls, at least, will be contaminated less than half as badly as though the second coat had been applied over the old, and one coat of the filth ought to be sufficiently unsanitary.

The local health officer should look to this matter of wall coating, but no class of public officers is so poorly paid as they. The State board should be furnished with as much money to use in this direction as is furnished for courts, etc. The towns should pay their health officer enough to spend his whole time, and he should have authority to go into every house and frequently, to not only look to the water supply, but to all the surroundings, including the condition of the ceilings, etc., and walls. If a landlord should then apply a second coat of paste, glue and paper, over an old filthy one, to poison a new and unsuspecting tenant, he would be dealt with as the law would authorize.

Fourth Session.—Tuesday, December 4, at 2 P. M.

The Convention was called to order by the President, after which J. C. Lampman, M. D., read the following paper on "Food and Its Adulterations."

FOOD AND ITS ADULTERATIONS.

BY J. C. LAMPMAN, M. D., HASTINGS.

In presenting a paper on "Food and Its Adulterations," I realize that I have a subject that not only interests us as medical men, but should, and does interest every man and woman in the land. Good, pure, and wholesome food, properly prepared, is not only essential, but absolutely indispensable to the well being of these bodies of ours. And equally as essential are pure air and pure water. These last two articles are not usually classed with the foods, yet with propriety perhaps, they might be so classed, as they go to sustain if not to actually nourish the body. But their importance is so great that they are generally considered under separate heads, the foods proper being those substances that require digestion before they are in condition for assimilation. In looking up the statistics on the adulteration of foods for the last few weeks, I have been greatly surprised at the magnitude and universality of the practice as carried on in some of our large cities. Of course everybody knows that ground or prepared goods, as ground coffees, pepper, spices, etc., could not be sold below the price of whole goods unless they were adulterated, or of inferior quality. But I was not expecting to see the report of the chemist on the analysis of cream of tartar state that it contained 100 per cent of adulteration.

In the report of Mr. Horr, from the committee on commerce, of the House of Representatives of the 47th Congress, I read that in the analysis of 18 samples of cream of tartar, bought for the purpose, that only six were found of satisfactory purity, 10 contained lime, varying from 17 to 90 per cent, and three of them nearly the latter figure; two of the samples contained no cream of tartar at all, but were wholly made up of adulteration. In the report of Mr. Casey Youngs to the 46th Coggress he tells us of samples of cream of tartar, by analysis, being found to contain 75 per cent of "terra alba," or white earth. Dr. Squibb, of Brooklyn, N. Y., found a variation of from 10 to 90 per cent of adulteration in different samples of cream of tartar, and it was mostly "terra alba."

Ground pepper has, next to cream of tartar, probably more frequently and to a greater extent received the attention of the adulterator than any other of the spices or condiments. Dr. Barnes, of Traverse City, in a paper read before the sanitary convention, held in that city last year, says, that he was once permitted to see the inner workings of a ground goods manufactory, and by way of illustration gives a copy of an order of a jobber for 500 boxes of ground pepper, which reads as follows:

50 boxes with 30% adulteration, 50 boxes with 50% adulteration.
100 " " 60% " 100 " " 75% "
100 " " 80% " 100 " " 90% "

He says that similar orders for other goods run from 20 to 80 per cent adulteration. And he further states that 60 per cent adulteration was labeled strictly pure, and 80 per cent adulteration as xxx pure; such labeling of

course, could have no other effect than to mislead the retailer, and swindle the consumer. The spice mill was simply furnishing what the jobber ordered. Of what these adulterations consisted he did not state; but Mr. Horr in his report to the 47th congress, before referred to, states that in the examination of four samples of pepper taken from respectable houses in N. Y. city, one was pure, the other contained baked flour, and rice with sand enough to prove the unclean condition of the pepper when milled. He also says that the chemist of the National Board of Health, in the examination of 1,116 samples of pepper, found 576 adulterated with rice, sago, potato-starch, brown and white mustard wood, wheat bran, flour, oat flour, and ground gypsum. Of 32 samples which were purchased, four were found pure; the remaining 28 were mixed with ingredients which weakened their strength and impaired their usefulness.

Other ground spices, as cloves, cinnamon, allspice, etc., have been examined, and found in nearly as bad condition as the pepper. Dr. Piper, a chemist and microscopist of Chicago, says: "I could fill a volume with the adulterations which I have found within a few years past in articles of food and drink in common use, by microscopical and chemical analysis." He further says that he has made more than a thousand microscopical examinations of milk in that city, and not more than ten per cent were found wholesome and unadulterated.

Milk is so easily adulterated that it has probably received more than its share of sophistication. It doesn't need a practical chemist, or an expert at the busines to add lime water or water and chalk to milk, and thereby increase the quantity and add to the size of the seller's pocket-book. I have heard of the milkman accounting for a minnow being in the milk by the cows drinking at the creek. And I once read of a milk-man claiming that it was no mercenary motive that impelled him to add water with a little chalk held in solution to his milk, but it was for the good of his customers, that clear milk was too liable to sour, and too concentrated a food for most stomachs, especially children, and as he had the good of his customers at heart, he prepared his milk accordingly, and that he made no extra charge for his time in preparing it, or for the ingredients added.

Cheese is frequently not the product of the entire milk. Two years ago the past summer I visited a cheese factory in the state of New York. After the milk was strained into the vat, they proceeded to cool it as rapidly as possible by means of pipes let down into the milk through which was running a stream of cold water. In about forty minutes a pretty good cream had arisen to the surface, which they proceeded to skim off to make into butter. Then the pipes were charged with hot water or steam; the contents of a vial containing a yellow looking liquid was added, to give the cheese the proper color, and the process for manufacturing cheese was continued. Whether such cheese would be more or less likely to contain tyrotoxicon or cheese poison, than that made from the entire milk, I am not prepared to say. That it is no better for the addition of the coloring matter is my opinion; and that it is less nutritious than cheese made from the entire milk is self-evident.

Sugar, of which such immense quantities are used in this country, has also received its share of attention. Since the introduction of glucose or corn sugar, the unscrupulous manufacturer readily finds an article, cheap, and one that is not easily detected, except by chemical analysis, with which to

dilute his sugars, increase their weight, and thereby increase the margin of profit. Mr. Casey Youngs in his report to the 46th congress tells us of one single factory that uses 5,000,000 bushels of corn per year in the manufacture of glucose; and another that uses more than 2,000,000 bushels. H. W. Wiley, in a paper read befere the American Scientific Association in 1880, says that ten glucose factories were running then in the United States and produced over 200,000,000 pounds per year, that eleven more were then building, which would increase the capacity of manufacture to 500,000,000 pounds per year. How many more have been built since then, and what their capacity is at the present time, I have no means of ascertaining. But that the greater part of this large quantity finds a market through the agency of cane sugar and confectionery is unquestionable. We once had a confectioner in this city whose barrel of glucose I saw, and he stated that some of his candies could not be made without it. Fancy confectionery generally, is no doubt largely glucose.

If glucose were as healthy an article of diet as cane sugar, there would be less objection to its use. But then it would be a swindle and a fraud to sell it for cane sugar, for it has considerably less than half the sweetening properties of the latter article. But that is not all. Chemical analysis finds in it a sufficient amount of free sulphuric acid to make it unwholesome, to say nothing of other impurities. Some of the brown sugars in the market have been found by chemical analysis to be made up quite largely of glucose—60 to 70 per cent, while the better grades generally contain a less amount.

The genuine cut loaf is no doubt usually pure, while pressed lumps, which are usually sold for loaf sugar, have been found to be made up largely of glucose.

Most of the syrups and molasses in the market are said to contain glucose.

Dr. Kedzie, formerly of the State Board of Health of this State, in the analysis of 17 samples of table syrup found 15 made of glucose; and of 20 samples analyzed in Chicago, only one was found pure. I have read of cargoes of glucose being shipped to New Orleans, to come back as New Orleans sugar and molasses. I have some syrup in the office made of confectioners' A sugar. Upon testing it, I found it quite strongly acid in its reaction, and containing considerable glucose. Powdered sugar showed more than a trace; and in a sample of granulated sugar, its presence was not wanting; while a pressed lump, and cut loaf gave no reaction for glucose, as was also the case with a sample of quite dark brown sugar. A sample bought for New Orleans molasses contained considerable glucose.

Baking powder, according to the advertisements of the manufacturers of Royal Baking Powder, is not only adulterated, but is made up of articles detrimental to the public health. While cream of tartar costs about ten times as much as alum, is it to be wondered at, that the economical manufacturer of baking powder substitutes the latter, for the former article? And when we remember how great a love the American people have for money, could we expect them to sell the manufactured product for any less, then if made from the pure cream of tarter? A smaller price would indicate the unreliability of the powder, without an analysis.

Our drinks are quite as frequently tampered with as our foods. The Detroit daily *Tribune* of October 31, 1888, in an article written by Geo. E. Drury, says that 80,000,000 pounds of tea are imported into the United States annually, and that 60,000,000 pounds are more or less adulterated;

that the adulteration consists of artificial coloring with Prusian blue and arsenic, and that in China they are sometime loaded with clay and sand, and that Japanese tea dust and the siftings from green tea frequently contain 10 to 20 per cent of sand. Mr. Drury claims that English breakfast, a black tea, is usually pure, as are also the Oolong teas. Others contain spent tea leaves, and sometimes leaves of other plants.

Ground coffee is usually adulterated, generally with harmless articles as chicory, pease, beans, etc. Coffee ready browned is sometimes given a coating to improve its appearance. This coating is not always harmless, as lampblack and chromate of lead have been used for such a purpose.

Canned goods, put up in tin, especially fruits and vegetables that contain an acid, are not always safe articles of diet. I was called a few years ago to visit a family in this city, every member of which was suffering from sore mouth, with some of them the soreness extending down the œsophagus to the stomach; some of the children sick in bed. I suspected something wrong with their diet, and inquired what they had been eating. They said they had eaten some canned tomatoes they had obtained at the grocery. A few of the cans were brought in, and the dark color, almost rusty appearance inside of the cans, proved beyond a doubt that that was the source of their trouble. No more tomatoes were used and they slowly recovered.

Many more articles might be enumerated, but it will hardly be profitable to continue this subject further. Until the law compels the manufacturers to label all their goods in strict accordance with the contents of the packages, it is advisable that their use be wholly avoided. That more stringent laws to prevent the adulteration of not only foods and drinks, but also of drugs and medicines, are needed, is too patent for contradiction.

DISCUSSION.

Arthur Hazlewood, M. D., Member of the State Board of Health, of Grand Rapids:—We are all satisfied that these adulterations exist. Different State Boards have spent much money proving that adulterations exist. Oleomargarine of itself has no especial claim to be condemned as an article of food, but because it is bought for butter. So the adulterations of coffee may be harmless, but the coffee does not taste so good. We simply want the genuine. The retailer dictates to the manufacturer the amount of the adulteration and he does not care what it is. Candy is very largely adulterated, and so long as there is a demand for candy which shall be so much cheaper than sugar, glucose will be used by the manufacturers. Often the substance used for adulterating food is in itself harmful. Beers are frequently adulterated with salicylic acid. This is very dangerous to persons with diseases of the kidneys. This acid is sometimes added to canned fruits. The essayist spoke of legal control. Dr. E. H. Beckwith, before a committee in Ohio, urged that the law should require that every package exposed for sale should bear the name of its contents. If we had a law which compelled printing on all goods the actual contents, it would be a great step in advance, but a good deal of trouble to carry it out. Our legislature may do a good deal, but an officer must be appointed to execute the law. If the people insist that the coffee we ask for is coffee, and ground pepper is ground pepper, we can do as much as the strong arm of the law. It is a matter of pocketbook in most cases more than of health.

Hon. Foster Pratt, M. D., of Kalamazoo, then read a paper on the "Causation and Prevention of Insanity." This paper has not been received from the author.

William H. Young, M. D., of Nashville, then read the following paper on the "Restriction of the Communicable Diseases."

THE PREVENTION OF COMMUNICABLE DISEASES.

BY WILLIAM H. YOUNG, M. D., NASHVILLE, MICHIGAN.

The subject assigned to me for presentation to this convention, viz., "The Prevention of Communicable Diseases," is one which claims, or should claim, our most serious consideration. That some diseases are communicable or contagious, requires no argument to prove, as almost, if not all, are ready to admit the proposition as axiomatic or true. The admission of this truth, however, taken in conjunction with the fact that the diseases to which we refer not only prevail, but spread as epidemics, causing a not inconsiderable proportion of the deaths in every community, seems to carry with it the almost inevitable conviction that some party or parties are responsible for those cases of sickness and deaths. It is therefore of the greatest importance that we institute the most diligent inquiry to ascertain, if possible, upon whom this responsibility rests. The pursuit of happiness, in a lawful way, is one of the unalienable rights accorded to every American citizen, and is a liberty of which we proudly boast. In the enjoyment of this boasted right, we are opposed by disease, which is at all times antagonistic to happiness and its pursuit, and a foe which all would gladly vanquish. When, therefore, preventable disease is permitted to exist, its existence is generally due to ignorance in regard to the manner of its propagation and in regard to the means we possess to prevent its spread.

The increase and disseminatiom of knowledge in regard to many of our contagious diseases have dispelled many of the dark clouds of superstition which enshrouded them in the past, and have enabled us to demonstrate that we have the power within ourselves to prevent their spread. In former times when the nature and modes of propagation of contagious diseases were less perfectly known, before sanitary science had been evolved, the wide spread epidemics of infectious diseases which prevailed were looked upon as direct visitations from Divine providence, and punishments sent upon the people for sins committed. That they were punishments inflicted for neglect or violation of nature's unchanging law, no one can doubt. Experience has taught us that relief from the punishment does not follow from the invocation of Deity to stay the plague, so long as we continue to transgress; but that if we would avoid the punishment, we must avoid the cause. From a knowledge of these and similar facts, we have been gradually brought to the conclusion that those epidemics of what is now known to be infectious diseases were due rather to man's ignorance and improvidence than to God's providence.

We have not yet attained to positive knowledge as to all of the etiological factors in the production of contagious diseases, yet the number known or believed to be due to specific causes is constantly increasing.

In only comparatively few instances have we been able to isolate the specific germs which produce the diseases in question, but in those instances in which we have been enabled to do so, we find that each germ produces its own specific disease, and that diseases are not interchangeable. Notwithstanding this, we not infrequently hear of persons being taken sick with some type of malarial fever, and that in due process of time it runs or transforms itself into a typhoid fever. Such instances are, in all probability, simply cases of

mistaken diagnoses. So far as we know the bacillus producing typhoid fever produces that and nothing else, and the germs of malaria, whatever they may be, produce malarial fever and nothing else. The change, therefore, from one disease to another is a change in the mind of the diagnosticator rather in the disease of the patient. That small-pox and similar diseases are not produced spontaneously and are not evolved from other diseases, is so thoroughly believed and understood that when a case appears, its source is at once sought for in some previous case of the same disease. As a result of this knowledge, when a case of small-pox appears, vigorous measures of quarantine and isolation are adopted, and what at one time would have resulted in an epidemic with its resultant deaths, is now checked in its incipiency, so that the mortality from small-pox is quite insignificant when compared with what it formerly was, or with what it now is, from many other diseases in regard to which no such measures are taken. Now what isolation and quarantine have done for us in the prevention of the spread of small-pox, they can do for us in the prevention of many other of our most fatal diseases, if vigorously enforced. Although we have not as yet been able to isolate and define all of the several germs which we believe to be the producing cause of all of our contagious diseases, yet we have the best of reasons for believing that such germs do exist, and that their vitality is not invulnerable, but is susceptible of being destroyed by means within our reach.

Observation fully demonstrates that dark, damp and poorly ventilated dwellings, as well as overcrowding, are detrimental to health, and if such conditions do not cause the development of disease germs *de novo*, they at least furnish a suitable soil for their propagation. Persons living under such conditions have less vital, resisting powers than others, so that in the presence of disease they become an easy prey to its ravages. Among the most fatal of diseases consumption holds a prominent place; not less than fifteen per cent of all of the deaths in the United States being due to this cause alone. Whether this disease can be properly classified among the infectious diseases or not is at the present time an unsettled question. Many facts, however, have been observed tending to show that there are at least some grounds for assuming its contagious character. Whether the *bacillus tuberculosis*, which is so constantly found in the sputa of those affected by tuberculous disease is the immediate cause of the disease or not, there is abundant evidence to show that the artificial introduction of those germs into the bodies of the lower animals produces in them symptoms and death similar to consumption in man. Since the sputa of consumptives contain those germs in large numbers it would appear to be a matter of some importance that more care be taken to disinfect the sputa of such patients, or some means taken to destroy those germs so as to prevent their possible introduction into the bodies of others. Whatever influence hereditary transmission may have in the causation of consumption, it is not at all impossible that direct infection may have a more important place in its etiology than has hitherto been assigned to it. Hereditary transmission does not necessarily imply that in those so predisposed there are inherited but latent germs, ready upon the slightest provocation to spring into activity and grow, but may imply that in such persons there may be an inherited lack of the necessary vital and resisting power or vigor to throw off those germs when accidentally introduced into the system.

With this possibility in view, the importance of isolating the sick from the well, and especially from those in whom there may be this hereditary taint or weakness, becomes manifest. Isolation in many cases, however, may not be practicable, owing to the long duration of the disease and other circumstances which may surround the case. Here, as elsewhere, in infectious diseases, disinfection of the excretions should find an important place. As this disease is almost universal in its spread, and as the germs which produce it, or at least so constantly accompany it, are being constantly thrown off in the excretions, a thorough disinfection of the excretions should be insisted upon, and isolation carried out as far as practicable.

But leaving this field of speculation and theory, there are some facts to which I wish to call your attention. Regarding typhoid fever, scarlatina, measles, etc., our knowledge is much more definite, and the results already obtained from isolation and disinfection have been unmistakable and convincing. Places in which outbreaks of those diseases have occurred, in which a system of careful isolation and disinfection, such as has been recommended by our State board of health, has been adopted, the whole number of those attacked by the disease has been quite insignificant when compared with similar outbreaks in places in which no such measures have been taken. The measures to be adopted for the prevention of the spread of communicable diseases have been so well set forth and so thoroughly made public by means of circulars and otherwise, by our State board of health, that it would be a waste of time to attempt to mention them here. In order to avoid disease our dwellings should be dry, well lighted and ventilated, thus preventing the formation of a soil suitable for the development of disease germs.

Our water supply should likewise be pure and free from contamination from decomposing vegetable or animal matter. Impurity of drinking water is one of the chief sources of typhoid fever. In this State, in rural districts at least, this cause of disease is avoidable, as in almost every locality there is an abundant supply of pure water obtainable at a minimum of trouble or expense, and once obtained, its contamination is the result of ignorance and carelessness. In cities and villages the question of procuring and maintaining a suitable supply, in a pure condition, is a much more difficult problem, but upon its correct solution important interests are depending.

To conclude, I would say, that if we wish to prevent disease, more care must be given to the sanitary condition of our dwellings; more attention given to insure purity in the food we eat and the water we drink, and when disease makes its appearance among us, an immediate resort to isolation of the patient, and disinfection of all excretions and of everything that, from exposure, might contain or carry the infection to others. In this way only can we hope to wage successful warfare against contagious diseases.

DISCUSSION OF THE SUBJECT OF COMMUNICABLE DISEASES.

John Avery, M. D., President of the State Board of Health, Greenville:—I can only enforce what has been so well said in the paper. Small-pox at present exists in seven places in this State,—a thing that has not occurred before for some time. Yet there will probably not be a great loss of life because there is such a wholesome fear of the disease that it will not be allowed to spread. The man who brought the disease to Howell, in this State, was supposed to have chicken-pox. In some communities it may spread in this way because it is not known what disease it is. But when small-pox is known to be in a community, public sentiment demands its isolation. People will keep away from it and then, too, we have a preventive in vaccination. Though vaccination is neglected when there is no small-pox in the State, now all are excited and every one is vaccinating. The efforts of

the State Board of Health have been to enforce this knowledge on people in regard to other diseases. One of the objects of this Convention is to inform people that we have in Michigan constantly diseases as dangerous as small-pox. It is not always possible to prevent the first case of a communicable disease, because we can not tell where the first case came from. Then the responsibility of restriction rests on the community, the physician and the Board of Health. If the family is poor, the authorities must see that the family is provided for, because the case must be isolated. Public sentiment demanding isolation and restriction is constantly growing. There are now probably twenty places in Michigan where scarlet fever exists, probably a like number of places where diphtheria exists, but instead of spreading, they are confined to one or to a few families, sickness is prevented and lives are saved.

Fifth Session.—Tuesday, December 4, at 7:30 P. M.

The Convention was called to order by the President, after which Prof. J. W. Roberts, of Hastings, read the following paper on School Hygiene:

SCHOOL HYGIENE.

BY PROF. J. W. ROBERTS, OF HASTINGS.

No more sacred trust is enjoined upon us, as American citizens, than the proper supervision of the physical as well as the intellectual and moral development of the young; for upon this development depends, to a great extent, the well being of generations yet unborn. Health is to the young a capital, which it is the bounden duty of teachers, school boards and all in authority over them to protect, and a failure in this regard should be considered criminal. To complete a course of study such as that adopted by the Board of Education of this city, requires twelve years, or 2,400 days of school attendance. During this time not only the character but the future physical well being of the individual is largely determined. By all who have given this subject careful consideration, it is believed that the health of pupils is much more endangered by inconvenient and ill-regulated schoolhouses than by the requirements of school work. It would be impossible in the time assigned for this paper to treat with any degree of fullness the different elements which may contribute to the health of the young in the schools, but I will speak of some of the more prominent ones which are not likely to be presented by other papers read before this convention:

First, let us consider the question of school buildings. In the selection of sites, too much care cannot be exercised. No stagnant ponds or marshes should be near the building, and the ground should be thoroughly drained. Modern science will not warrant the permission of more than two stories of school rooms, and my observation with regard to the basement rooms of the central school building of this city, which are not occupied for study, would lead me to advise strongly against the use of rooms all or a part of which are under ground. Such rooms may serve for play-rooms and gymnasiums, when well ventilated, but the dampness of the air within them is too deleterious to health to admit of their being used as class rooms. The false economy shown by district school boards in the erection of buildings without any means of ventilation is deplorable. I venture to say that the additional tax paid in the way of doctor bills for diseases contracted by breathing air

vitiated by exhalations from pupils' bodies, odors from bad breaths and disordered stomachs, would pay every year for the very best system of ventilation.

There is a great lack on the part of school boards, especially in district schools, to provide for the cleaning of school rooms. In order to prevent the rising of a cloud of dust in the room when classes pass, the floor should be cleaned with water once each school month, and certainly not less frequently than once each school term, not only to remove dust but other injurious particles, organic matter, etc., which may accumulate.

One of the most effective means of causing curvature of the spine and predisposing children to lung diseases, is that of requiring them to sit at desks which are so low in many cases that the trunk is thrown in an almost horizontal position in order to write upon them. The seats and desks of the room should be so graded that both large and small may be accommodated with seats which will permit the feet to rest on the floor, and the desks should be so arranged that an erect position may be assumed while writing upon them. Teachers cannot be too careful in guarding the many avenues through which the health of their pupils may be impaired. Better spend less time in studying the effects of stimulants and narcotics on the different organs of the body and their construction than to neglect the study of the best means of preventing diseases in these organs. How the purity of the air in the school room may be secured is a question of vastly more importance to us than its composition. The carelessness of allowing pupils to lean forward on desks, with eyes within five or six inches from paper while writing or drawing, is inexcusable. My observation leads me to believe that the tendency towards contraction of diseases of the eye is greater during these exercises than any other. Pupils should not be required to walk on tiptoe to and from classes or to sit with arms folded throughout a recitation. The barbarous punishment of requiring pupils to stand for long periods of time in unnatural positions is another way of producing injurious effects upon the body. The filthy habit of using saliva in the erasure of slate work provides an additional means of impregnating the air with noxious germs. In grades where the greater part of the written work is done on slates, a sponge should be attached to each slate or desk, and a bottle properly adjusted for preserving small quantities of water should always be convenient.

The teacher should frequently talk to her pupils about the care of the teeth, eyes, ears, bathing, and endeavor to inculcate in them, habits of cleanliness. As the questions of the admission of light into the schoolroom and the mode of heating and ventilating will be thoroughly discussed by other papers read before this convention, I forebear to speak of these; but we will now consider the question as to how the physical development of the young may best be made to keep pace with the intellectual.

The question is often asked: Why are so many leaving the fields of manual labor and entering those of mental, or of no useful labor at all? The answer that in my opinion ought to be given to these questions is, physical education is neglected. The kind of physical education that is wanted, is four or five hours daily toil, from say the age of 12 to the age of 21. Labor at the work bench, at the anvil, in the garden, on the farm, labor that will lighten the burden of parents and add to the wealth of the nation. How often do we find grown up sons and daughters in middle, and even in poor

circumstances, who have been dead weights about their parents necks ever since they were born. That father who brings up a son to man's estate without habituating him to manual labor, wrongs that son and wrongs the nation. The mother who brings up her daughter to womanhood, without making her acquainted with household work, and skillful in its performance, pierces that daughters breast with many sorrows, and does violence to generations yet unborn.

Is not our system, as conducted, calculated to predispose to sedentary pursuits rather than to out door ones. Here is a young man, who has attended the high school, entered college and has just obtained his B. A. What openings are before him? He will not become a carpenter, a blacksmith, or a farmer. The habits which he has formed, the tastes which he has acquired, render each of these occupations distasteful to him. He will not engage in any calling that requires continuous bodily toil. Besides were he disposed to engage in any kind of handicraft the probabilities of his excelling in it are against him. The age for acquiring that manual dexterity necessary in almost every kind of handicraft is gone. His education, therefore, instead of enlarging the number of callings from which he may select, has cut him off from those in which the majority of men must necessarily make a living.

There is no course for him but to essay a calling already full to overflowing. If by pluck, energy and ability, or by good fortune he succeeds, all is well. But if he does not succeed, what then? A man with the education of a gentleman, habits, tastes, and aspirations of a gentleman becomes what? You may say to me: you have been finding fault with the existing state of affairs but you have not proposed remedies. In this regard, I must confess that I am not equal to the task but I will do what I can. The most important part of physical education cannot be carried on in schools; from this it follows that schools should be so conducted as to afford time and opportunity for physical culture elsewhere. In villages, towns and cities, instead of having 50, 60, or more pupils under a teacher in the elementary departments, there should not be more than 30. Instead of having all under the teacher at the one time, they should be divided into two sections, one attending school in the forenoon, the other in the afternoon. The advantages would be:—

1. Less school accomodation would be required.
2. There would be more teaching and less keeping order, more work and less worry.
3. There would be more bodily activity and greater progress in learning.

As to the number of teachers under the system proposed, I am of opinion it would not be increased, because the pupils would pass through the different grades much more rapidly than they do now. Country schools should be kept open during the summer half of the year from eight until eleven for the larger pupils, and from two until five for the smaller ones. The advantages would be:

1. A portion of each day would be devoted to study and another portion to work on farm or in the house.
2. Each child would have a warm dinner at home with the family instead of a cold lunch as at present.
3. The smaller ones would have secured to them their fair share of the teacher's time and attention.
4. The difficulty of governing would be much lessened, only half of the pupils being under the teacher at a time.

5. The intervals between recitations being shorter there would be greater mental activity.

6. The teacher having his dinner at his leisure and having a considerable rest thereafter, would be better able to do justice to his pupils.

7. Much of the misconduct that prevails during the noon hour would be avoided.

8. The period for continuous attendance at country schools would be lengthened and the intelligence of country people would be materially increased.

9. Continuous labor in the field from daylight until dark, on long summer days, would not drive so many country boys into towns in the often vain hope of finding an easier and more desirable way of making a living.

The proposed change carefully carried on through all grades of schools would, I believe, result in the development of a higher type of humanity, physically and intellectually.

This paper was discussed by Arthur Hazlewood, M. D., of Grand Rapids, Mr. Ellis, of Hastings, and A. Arnold Clark, of Lansing.

The next paper was by D. E. Fuller, M. D., Health Officer of Hastings, on "The Duties of the Local Health Officer."

DUTIES OF THE LOCAL HEALTH OFFICER.

BY D. E. FULLER, M. D., HEALTH OFFICER, HASTINGS.

If in my efforts to point out some of the work that is expected from the local health officer, I shall be successful in making any point that will elicit discussion which may enable me or any other officer in the same capacity to better serve the public in the prevention of epidemic diseases, I shall accomplish as much as I expect, and will be fully satisfied with my efforts. Much may be done in every community by its inhabitants to facilitate the work of the Board of Health and protect themselves against epidemics of communicable disease. Indeed without this coöperation of the public the usefulness of the health officer is very much restricted. Let every person see that his own premises and belongings are clean, and complaints of nuisance would be conspicuous by their absence.

The State of Michigan gives us good health laws to protect ourselves; if we suffer from the violation of these laws we have no one to blame but ourselves. Ignorance of the law is no excuse for its infringement.

The State Board of Health is very liberal in its distribution of documents setting forth the course to be pursued upon the outbreak of any contagious disease. No doubt there are some present who are not familiar with some of the more important laws made with reference to the duties of householders in case of an epidemic; and the belief that a better understanding of these laws would materially assist the health officer in his important work is my apology for reading some of them in this place.

Act No. 146, laws of 1879, provides that householders and physicians must immediately give notice of the first case and of every case of scarlet fever, to the health officer or to the Board of Health. This is required by sections 1734 and 1735, Compiled Laws of Michigan, 1871 (§§ 1675, 1676—Howell's statutes), as amended by Act No. 11, Laws of 1883, which with the new section (50) added in 1883, are as follows:—

"(1734.) Sec. 43. Whenever any householder, hotelkeeper, keeper of a boarding house, or tenant shall know, or shall be informed by a physician, or shall have reason to believe, that any person in his family, hotel, boarding house, or premises is taken sick with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice thereof to the health officer, the president, or the clerk of the board of health of the township, city, or village in which he resides. Said notice shall state the name of the person sick, the name of the disease, the name of the householder, hotelkeeper, keeper of boarding house, or tenant giving the notice, and shall, by street and number, or otherwise, sufficiently designate the house in which he resides, or the room in which the sick person may be; and if he shall refuse or neglect immediately to give such notice, he shall forfeit for each such offense a sum not exceeding one hundred dollars: *Provided*, That this penalty shall not be enforced if a physician in attendance has given to the health officer or other officer hereinbefore mentioned an immediate notice of said sick person, and true name of the disease, in accordance with the requirements of this section.

"(1735.) Sec. 44. Whenever any physician shall know that any person whom he is called to visit, or who is brought to him for examination, is infected with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice thereof to the health officer, the president, or the clerk of the board of health of the township, city or village in which the sick person may be; and to the householder hotel-keeper, keeper of a boarding house, or tenant within whose house or rooms the sick person may be. The notice to the officer of the board of health shall state the name of the disease, the name, age and sex of the person sick, also the name of the physician giving the notice; and shall, by street and number, or otherwise, sufficiently designate the house or room in which said sick person may be. And every physician and person acting as a physician, who shall refuse or neglect immediately to give such notice shall forfeit for each such offense a sum not less than fifty nor more than one hundred dollars: *Provided*, That this penalty shall not be enforced against a physician if another physician in attendance has given to the health officer, or other officer hereinbefore mentioned, an immediate notice of said sick person, and the true name of the disease, in accordance with the requirements of this section.

"Sec. 50. For each complete notice in writing to an officer of the board of health, in full compliance with the preceding section, requiring from physicians or other persons notices of diseases dangerous to the public health, the physician who gave the notice shall be entitled, on duly certifying that each notice was correct, and when the bill has been duly audited by the board of health, to receive from the township, city, or village, in which the notice was given, the sum of ten cents."

The law is plain as to the giving of notice. It does not say report when it is convenient, in one, two or three days, as the case may be, but provides that such notice must be given immediately. Now, right here is one reason why we meet with objections to placarding infected premises. In many instances reports of such infection have been neglected until patients are convalescent, or nearly so, and we are met at the door with this remark: "We are all well now; we are all over the disease; there is no need of placarding the house." Now, so far as placarding infected premises is concerned, there ought to be

no objection to it, and I think there would be less if it was generally understood that it not only protected the public, but also afforded immunity to the afflicted family. Keeping secret contagious diseases is dangerous to the householder, in making him liable to criminal prosecution, as well as civil damages, should one innocently contract the disease by reason of such neglect.

The law includes diphtheria, scarlet fever, measles, small-pox and typhoid fever. No doubt if there should be a case of small-pox in our city, it would be promptly reported, but what has been the ratio of deaths from small-pox compared with diphtheria, scarlet and typhoid fever, during the last eight years? Better neglect to report small-pox than diphtheria, for there are fifty graves of diphtheria and scarlet fever to one of small-pox, in our country.

If the health officer is a physician, which in most cases he is, and you call at his office and do not find him at home, do not let that be an excuse, that you called to report a case, but did not, in consequence of his absence. Leave a written notice, or report to the clerk of the board, or to the mayor,—only report.

If you depend upon your attending physician to give notice for you, find out, as soon as possible, whether he has done so. Upon receiving such report it is the duty of the health officer "to investigate the subject in behalf of the Board of Health;" "to order the prompt isolation of those sick or infected with such disease so long as there is danger of communicating the same;" "to promptly notify teachers of public schools concerning families in which are contagious diseases;" "to supervise funerals of persons dead from any disease dangerous to the public health;" "to give the public notice of such infected places by placarding the premises;" "to disinfect, rooms, clothing, and all articles likely to be infected, before allowing their use by persons other than those in isolation;" to keep the State Board constantly informed respecting every such outbreak.

This in brief is the substance of Sec. 1 Act 137, Laws of 1883. You see that the responsibility is not all on one side. The Board of Health comes in for its share. Indeed it is held responsible, and justly so, for any extensive epidemic of diseases which might have been stamped out in its incipiency. When sanitary regulations are established in any given case, the public has a right to assume that they represent the most enlightened thought upon the subject.

To illustrate the methods to be pursued and precaution to be taken, in the management of a case of scarlet fever: The first thing to be done is to get the patient in a room by himself in which all of the carpets, curtains and upholstered furniture has been removed, allow no one but the nurse to enter the room, and especially exclude children, no matter if they have had the disease. All the discharges coming from the patient should be received in a solution of sulphate of iron—one-half pound to the gallon. All clothing, as soon as it is not needed, should be placed in sulphate of zinc solution one-fourth pound to the gallon of water. No article of clothing should be removed while dry from the room. Use a damp cloth for dusting, so that no dust is raised in the room. By many it is thought best to anoint the patient with vaseline.

After the patient is convalescent cleanse with a warm bath and soap for four consecutive days, after which, if patient is free from roughness of skin, there is no longer any danger of his communicating the disease. The room should be thoroughly disinfected, the ceiling and walls scraped and whitewashed, the woodwork washed with the zinc solution, or the whole room and its contents treated with sulphur fumes, about three pounds to a room ten

feet square. In case of death the body should at once be wrapped in a sheet thoroughly soaked with chloride of zinc solution, placed in an air-tight coffin and buried immediately. What is true with reference to the management of scarlet fever is, with modification, also true in other infectious diseases.

Boards of Health should give more attention to the causes of disease and the methods of prevention. The predisposition to disease may be strong or feeble. In contagion there are always two causes: 1. The special cause, the germ or microbe, which is always derived from bodies of those infected. 2. The co-operating causes which are unfavorable hygienic conditions, improper food, bad air from deficient ventilation, and in fact anything which lowers the vitality promotes the development of such disease. The special causes are not always under our control. We may accidentally be brought in contact with the germ of contagion, not so with the co-operating causes which are largely controllable by attention to sanitary matters.

It does not seem improbable that some diseases may acquire contagious properties under certain unfavorable conditions and not so under others. For illustration, a case of common fever arising from common causes, as from cold (if the patient be kept in a close, foul situation), may be converted into a disease capable of producing emanations which may excite similar disease in those exposed to them. Anything tending to weaken or impair the bodily organs furnishes favorable conditions, and thus epidemics almost always originate in those quarters where dirt and foul air render sound health an impossibility.

Says one eminent sanitarian, Dr. Richardson, of England, in an address delivered before Brighton Health Congress: "By a few rules which every prudent and wise person may carry out in their own homes let me instruct you.

"Let every man and wife be their own sanitarians and make their house a center of sanitation. Let in the sun, keep out the damp, separate the house from the earth beneath, connect the house with the air above. Once, nay twice a year hold the Jewish passover, and allow no leaven of disease to remain in any corner or crevice; let the house cleanse itself of all impurities as they are produced; eat no unclean thing; come back to the first fruits of the earth for food; drink no impure drink; wear no impure clothing; do no impure act, and all the good that science can render you is at your absolute command."

The discussion of the paper was led by Henry B. Baker, M. D., of Lansing, Secretary of the State Board of Health, as follows:

THE DUTIES OF THE LOCAL HEALTH OFFICER.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH.

Inasmuch as our health officers exist for the purpose of protecting us from dangerous diseases, we may get an idea of what are their most important duties by finding out what are the most important dangers from which they should protect us.

In Michigan the five diseases which cause the most deaths are: Consumption, diphtheria, pneumonia, typhoid fever and scarlet fever.

DIPHTHERIA.

Concerning diphtheria, which is next to the most fatal disease, health officers in Michigan now generally know how to restrict it, and thereby to save hundreds of lives. If you ask how do we know that they know how, I reply, some of the health officers in Michigan are doing this all the time, and we have the facts to prove it; and to prove how it is done. For instance, in 1886, 464 outbreaks of diphtheria were reported to the office of the State Board of Health, and the health officers were requested to report just what was done to restrict the disease, and how many cases occurred in each outbreak. If under one method of work or neglect to work the disease spreads, and under some other method of work the disease does not spread from the first cases we can find it out if we devote sufficient thought and work to the compilation of the reports which the health officers make, provided they report the exact facts. I am sorry to say that in about 240 of the outbreaks the health officers did not report with sufficient accuracy so that we could tell exactly what they did do; but in about 200 outbreaks they did report distinctly, and of these about one-half had secured isolation of the first cases, and the thorough disinfection of infected things, while the other half had not secured both isolation and disinfection, although some of them had secured one or the other of these important measures. Careful compilation of all of these reports showed that in those outbreaks in which either isolation of the sick, or disinfection of infected places and things had been neglected, the disease had spread so that there were about five times as many cases and five times as many deaths as there were in those outbreaks in which both isolation of the sick and infected, and the disinfection of all infected places and things had been accomplished. In the 116 outbreaks in which all this was done there was apparently a saving of about 300 lives and 1,500 cases of sickness from diphtheria. Of course it is easy to find fault, and to say: "What a pity these measures were not carried out in all of the 461 outbreaks instead of only in the 116," but we should not lose sight of the fact that there was a positive saving of several hundred lives, in a single year, from one disease, and that the compilation of the reports proved how it was done and how it might be done again, namely by thorough and careful isolation and disinfection under the direction of a capable and efficient health officer. And now very much the same thing has been done again, as is shown by the compilation of the reports of the health officers in Michigan for the year 1887.

SCARLET FEVER.

What I have said relative to diphtheria is applicable, with slight variation, to scarlet fever. The compilation of the reports of the health officers in Michigan relative to scarlet fever during the year 1886, showed that in the 58 outbreaks in which disinfection and isolation had been thorough, the disease had not spread much, while in those outbreaks in which isolation or disinfection had been neglected, there were over five times as many cases and over five times as many deaths. The compilation of reports relative to scarlet fever in the year 1887 has demonstrated that the year 1886 was not exceptional, the saving of life and health was again apparent.

TYPHOID FEVER.

The measures for the restriction of typhoid fever are not the same as for diphtheria and scarlet fever, and the evidences of success have not yet been so well elaborated, but I feel confident that a considerable proportion of the sickness and deaths from this disease may be prevented by measures which are described in a pamphlet, copies of which are distributed in this audience. Some of the essential measures need the efforts of the health officer to make them most effective; but in all of these diseases the co-operation of the people with the health officer is important.

WILL IT PAY TO HAVE A HEALTH OFFICER?

It is plain, then, that some of the most fatal diseases that afflict us may be in great part prevented, and that much depends upon the knowledge and efficiency of the local health officer.

It is plain, too, that the measures by which these diseases are prevented are not those which in old times we associated with the duties of the health officer. The abatement of ordinary nuisances should probably be attended to by the health officer; but the abatement of nuisances may have very little to do with the prevention of diphtheria or scarlet fever; while it is certain that isolation and disinfection of infected persons and things will save lives.

But when the health officer comes into very close relation to cases of some of these dangerous diseases, he must himself refrain from going directly to some child to whom he may carry the disease; and so he must lose his practice. He will also lose much by the antagonism of those whose movements he will cause to be restrained. Consequently, whenever there is an outbreak of one of these disease, if he attends to his duties as health officer, it is probable that he must relinquish his other means of income. Is the public prepared to guarantee him say, ten dollars a day during the outbreak? Is the public prepared to insure him against loss by reason of his necessary action as an efficient health officer? If not, is the public willing to give him such a fixed salary as will induce the health officer to take his own chances of loss?

My belief is that, except in Detroit and Grand Rapids, there are few if any cities or villages in the State where these questions have been properly met in the interests of the people. Therefore, either the health service is not what it should be, as is the case in many places, or it is what it should be simply through the public spirit or philanthropy of some physician, as I am glad to testify is the fact as regards many of the cities and villages in Michigan.

Perhaps you may think I am wandering from the subject of the duties of the health officer, and am giving a rather broad hint as to the duties of the people or their representatives to properly support the health officer; but it is necessary to examine into the question in some such manner, in order to see how it is possible to have a health officer who can afford to perform his duties faithfully. Taking into consideration the prospective losses in various ways, my own view is that no physician can afford to file his oath of office in the city of Hastings unless he is assured of a salary or compensation averaging a thousand dollars a year. Can the city afford to give that much? Let us examine into the facts.

LIVES MAY BE SAVED IN HASTINGS, AND MONEY TOO. *

The population of Hastings is about three or four thousand. If its death-rate is about the average, the annual deaths number about sixty. Then about seven or eight of these are from consumption, about five from diphtheria, about two from scarlet fever, and about two from typhoid fever. These numbers may not be exactly true for last year, but for a long series of years they are an approximately true average.

From the experience of the health officers in Michigan during the years 1886 and 1887, I have demonstrated that at least 80 per cent of the cases of the sickness, and 78 per cent of the deaths from diphtheria are prevented by those who secure, after the first case has occurred, complete and thorough isolation and disinfection, such as an efficient health officer can secure when his people co-operate with him for that purpose. Therefore the lives of at least four persons in Hastings can be saved each year, on the average, from that dreadful disease diphtheria. There may be single years when diphtheria may not come to Hastings, and then some parsimonious grumbler might wish to cut down the salary of the health officer, perhaps after the same health officer had in some way prevented the first case being brought in, as, for instance, by preventing a public funeral over the body of one dead from diphtheria, and brought here for burial; but I think you can be assured that in these days of rapid transit and constant movements among the people, Hastings is in danger of having diphtheria brought here in every year, and you need a health officer constantly on guard and in close correspondence with the central office at Lansing so that, at a moment's notice, he may take action to prevent the introduction, or if that is impossible, then to prevent the spread of this one of the most dangerous diseases to which our children can be exposed.

LIVES MAY BE SAVED FROM SCARLET FEVER.

Then, too, nearly the same remarks apply to scarlet fever as to diphtheria; although in recent years the deaths in Michigan are not so numerous. Yet, taking the average of years in Hastings, at least one death per year from scarlet fever should be saved by prompt and thorough action even after the disease has been introduced, and, of course, the most important service of a health officer is to prevent the introduction of such a dangerous disease.

CONSUMPTION SHOULD BE LESSENED.

Enough is now known of the causation and spread of consumption so that this most important cause of death should be very greatly lessened; and it may be lessened by spreading among the people information concerning its causes and just how it may be in great part prevented. An intelligent and faithful health officer whose time was not otherwise demanded for the practice of medicine to support his family, might do much to put before the people whom he was adequately paid for guarding, the facts collected by sanitarians and State Boards of Health which would enable the people to guard against this disease which is so fatal to them at those ages at which they

* This paper was read at a convention at Hastings; but the statements are true for other places of about the same number of inhabitants, so that for the word Hastings, wherever it occurs, the name of any such other place may be substituted.

should be in the prime of life. At least one death a year in Hastings should be saved from consumption.

LIVES MAY BE SAVED FROM TYPHOID FEVER.

Some one, familiar with the ways in which typhoid fever is spread, has said that for every death from typhoid fever some person should be held criminally responsible. I should not agree with that, because I think that among a large proportion of the people the ignorance which still permits the disease to spread should be pleaded in extenuation. But intelligent health officers can inform the people under their care how to restrict the spread of typhoid fever, and how to do many things which tend to prevent the occurrence of the first case in a community. At least one death a year in Hastings from typhoid fever ought to be prevented; and the person saved would be most likely to be in the middle age when his work would be most productive.

Thus an efficient health service, having thorough coöperation of the people, should save in Hastings each average year, seven lives, five of the persons being children and two grown persons. I do not say positively that exactly so many were saved during the past year, but I do claim, that, on an average, this number can be and should be saved over and above what would occur without such effeorts as those I have suggested. I claim that the health officer should earn and have a thousand dollars a year to supervise the work, and that all of your people should aid him whenever it is necessary, and that expenses should be incurred by the city and by individuals which might aggregate another thousand dollars; and that your people would not only save those seven valuable lives of children and friends most dear to you, but that, by this outlay, money in excess of the outlay would actually be saved which otherwise is lost, that is, if the money were judiciously expended and you secured the efficient service which I have indicated. Let me point out just how some of the saving would occur:—

THE MONEY VALUE OF WAGE-WORKERS.

Political economists sometimes estimate that an average man in the early part of the productive period of his life will afterwards earn, over and above what it will cost to support him, one thousand dollars. It is within the memory of some of us that a healthy negro slave could be sold at the South for eight hundred or a thousand dollars, and we will all admit that slaves were not the most industrious persons either. Now if we save from death, and in good health, two adult persons in Hastings in each year, we have saved in money value to the families to which those persons belong probably the full amount of the two thousand dollars a year, which I advise you to spend on your health service. Then there are the five children which are saved from dipththeria and scarlet fever. They have cost hundreds of dollars for their maintenance, and if they die all is lost, but if their lives are saved they will soon reach the productive age. They are worth to their families, for what they have cost and will earn, say one-fifth the value of an adult person—or another full thousand dollars which we may look upon as profits on our two thousand dollar investment. A 50 per cent profit ought to satisfy any taxpayer in the city. And if one of these children chanced to be your own, or the adult, the bread-winner of your own family, the argument

should be convincing; but there is another alternative suggestion which is illustrated by a remark that I recently heard at the meeting of the American Public Health Association,—Dr. Smart, of the United States army, was deploring the slowness of the people in public-health work, and said there was little comfort to be had from the thought that years in the future when your name is mentioned some one will say: "Yes, I knew him well; he died, prematurely, eight or ten years ago, of typhoid fever." Well, precisely that may be said of any one of us, because the safety of each one is bound up with that of others; no man lives to himself alone; not only is he his brother's keeper, but his brother, his fellow-citizen, and even a person in a foreign land may send him something or do that which will endanger his life. In fact I suppose that all of our dangerous communicable diseases are brought to us—we do not create them, and much can be done by ourselves, by our families, by the community, and by the health department of our local government (which exists for our common safety and welfare) to protect us from diphtheria, from typhoid fever, and from the other dangerous diseases which may be prevented or restricted.

Arthur Hazlewood, M. D., member of the State board of health, then referred to the statistics brought forward in the paper read during the afternoon concerning the importation into this country of insane persons, and offered the following resolutions which were adopted:—

WHEREAS, It is the opinion of this convention, that the importation into this country of insane persons, criminals and paupers is a practice fraught with danger to the health, morals, and pockets of our citizens; therefore,

Resolved, That the attention of our representatives, present and elect, is hereby called to this subject, that they may, on all proper occasions, direct the legislation of the country to the prevention of the importation of such undesirable additions to our population.

Resolved, That a copy of these resolutions be sent to the members of Congress of this State.

The following resolutions, prepared by the committee on resolutions, were then read by Hon. Daniel Striker, and adopted by a rising vote:—

Resolved, That the session of the Sanitary convention in this city, under the auspices of the State Board of Health, has been one of unusual interest to us as citizens of Hastings.

Resolved, That our thanks are due, and hereby tendered to all who have participated in this convention for the exceedingly interesting and timely topics presented, and the ability with which they have been discussed.

Resolved, That, as a result of this convention we have a much higher and better appreciation of the work of the State Board of Health, and regard it as the duty of the State to properly maintain this board, and lend all possible aid and encouragement to its efforts.

STATISTICAL ASSOC

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

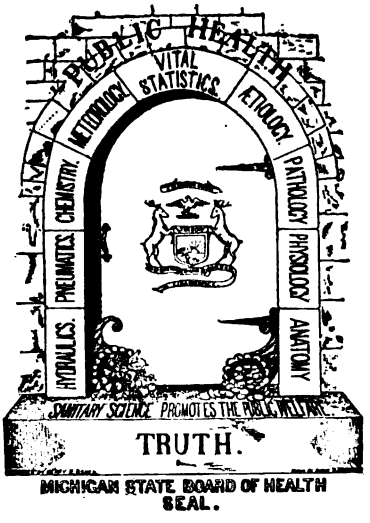
OTSEGO, MICHIGAN,

MAY 2 AND 3, 1889,

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF OTSEGO.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1889.]

No. 298.



MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
DARIUS D. THORP, STATE PRINTER AND BINDER.
1889.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

OTSEGO, MAY 2 AND 3, 1889.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1889.

Darius D. Thorp, State Printer and Binder, Lansing.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

"*Resolved*, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein."

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT OTSEGO, MICH.,

MAY 2 AND 3, 1889.

SUPPLEMENT TO REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1889.

This Convention was held, in compliance with an invitation from the citizens of Otsego, under the direction of a committee from the State Board of Health and a committee of citizens.

The following persons were the local committee: Dr. L. E. Clark, Chairman; Dr. Milton Chase, Secretary; C. H. Adams, Prof. G. A. Osinga, and J. F. Conrad.

The committee on music consisted of G. A. Osinga. The committee from the State Board of Health was Henry B. Baker, M. D., Lansing.

The officers of the convention were: President, Hon. J. M. Ballou; Vice presidents: John F. Conrad, Otsego; Dr. Henry F. Thomas, Allegan; Dr. Charles Thompson, Plainwell; Dr. Paul T. Butler, Alamo; Prof. Henry A. Simons, Allegan; Secretary, Dr. L. E. Clark, Otsego.

First Session—Thursday, May 2, at 2, P. M.

The Convention was called to order by the President, Hon. J. M. Ballou. After prayer by Rev. Geo. W. Culp, Hon. W. C. Edsell delivered the following address of welcome:

ADDRESS OF WELCOME.

BY HON. W. C. EDSELL, OF OTSEGO, MICH.

Mr. President and friends:—In behalf of the people of Otsego, I most cordially welcome you here as the messenger of God, bringing to us the gospel of health. Nothing is of more importance to us, while here, as individuals, as families, and communities, than good health. Our intellectual and moral faculties were doubtless given us that we might the better know how to take care of and develop all the faculties of our nature. Whatever

may be the condition of the higher attributes of man hereafter, and here, we find them dependent in a very great degree upon the physical organism.

If we want to be happy and useful in this life, we must have a healthy and well developed body. This can only be attained in its highest and best form by living in harmony with God's laws, and these are inexorable. The bullet sent crushing through the brain of Lincoln produced the same effect it would through the head of a Nero or a Gibbs.

Our habits of life have much to do with our health, much to do with our happiness, and I might say, all to do with our character. What we eat, and what we do, what we think and what we say, each day of our lives help make up our character, shape and fix our destiny, here and hereafter. The great work assigned us between the cradle and the grave, is the highest and best development of all the attributes and faculties of our being.

It is surprising to note how many professedly good people speak of and treat their physical organism as something necessarily low and groveling because it is composed of matter. Many christian people ridicule the idea that conscience or religion have anything to do with what we eat, and what we drink and the care we take of our bodies.

No wonder the apostle declared "If any man destroy the temple of God, him shall God destroy, for the temple of God is holy, which temple ye are."

We look upon the drunkard as a great criminal, and rightfully so. But is it any the less a crime for christian people to overload the stomach and gormandize until they become as stupid as a boaconstrictor after swallowing his deer.

These are all violations of the laws of life and health, and as such are criminal in the sight of God. Indeed it is more criminal to abuse ourselves than any one else, because God has committed the care and development of our faculties to us as individuals as he has to no one else, and for this reason he will hold us responsible.

Such a convention as this is designed and well calculated to enlighten the people and teach them how to obey the laws of life and health. Therefore we receive these friends with outstretched arms and warm hearts. We welcome you to this hall, we welcome you to our beautiful village, we welcome you to our homes.

Hon. John Avery, M. D., President of the State Board of Health, responded to this address, stating the objects of the Convention. Good actions and good influences, he said, were as contagious as disease, and where these conventions have been held the ideas brought forward have spread and much good has been accomplished. Nearly one-half of all the sickness in Michigan is preventable, and the object of this Convention is to disseminate knowledge as to the means of preventing such sickness. To have a sick person in the community is an absolute loss of money to every citizen, and all should be interested in such a convention as this.

Hon. James M. Ballou, President of the Convention, then gave an unwritten address.

Hon. John Avery, M. D., President of the State Board of Health, Greenville, then gave an unwritten address on the "Ventilation of Residences and Public Buildings," which was illustrated by diagrams on a blackboard.

Second Session—Thursday, May 2, at 7:30, P. M.

The second session of the Convention was called to order by the President. After music by a quartette and prayer by Rev. D. N. Canright, Prof. G. A. Osinga read the following paper on the "Hygiene of schools:"

THE HYGIENE OF SCHOOLS.

BY G. A. OSINGA, SUPERINTENDENT OF SCHOOLS, OTSEGO.

In the range of sanitary science there is no more important department than the one which has reference to the healthful condition of school-buildings and the well-being of the children.

The work done in this department not only conserves the health of the young, but it perpetuates itself by educating the child in sanitary science at an impressionable age. The subject upon which I was appointed to present a paper, viz., the hygiene of (our) schools, comprises, I apprehend, present conditions and suggestions as to how these conditions may be bettered.

As far as situation is concerned, our school building is in as healthful and sightly a spot as could well be found. The profusion of native oaks makes our grounds a pleasant retreat during the hot summer days; and, being removed from the noise of cars and factories, our pupils are advantageously situated for mental development.

The well from which our water-supply is procured is far removed from any possible sources of contamination, and I have failed to find any impurities deleterious to health with the reagents at my command. Formerly the water was perfectly clear, now it is somewhat roily. The last two dry seasons seem to have dried up the sources and it is probable that we get a large proportion of surface water. If the well were sunk deeper we might be able to procure a purer and more abundant supply.

The great need of public buildings is an adequate method of furnishing a frequent change of air. This subject has been so thoroughly and so often discussed that it seems somewhat stale, but it is evident that the average person does not realize the fact, and how to impress it upon his mind is the question. People know theoretically of this need while practically they sit in stuffy rooms and endanger their health. School-buildings will be erected in this year of grace 1889 with never a thought as to how the crowded occupants are to obtain the necessary oxygen.

If one will try the experiment of lowering a lighted candle into a jar of air freshly exhaled from the lungs, he will see the need of ample means of ventilation. Where the candle goes out man can not live. There are many sources of contamination of the air of a a school-room. The natural exhalations from healthy lungs, the odors from decaying teeth and from sickly children, the organic matter emanating from the skin, the dust from chalk and numerous others. With all these impurities constantly vitiating the air it is plain that a room ought to be furnished with an abundant fresh supply. In our building the means are insufficient. The rooms are heated by stoves and ventilated by lowering windows. Constant watchfulness on the part of the teachers keeps the air in a fairly pure state, but we are continually imbued with the idea that we must steer between the Scylla of pneumonic troubles and the Charybdis of a vitiated atmosphere.

Since these two subjects, heating and ventilation, are so closely related I

must consider them together. Our system of heating is open to several objections: The room is not heated evenly; some pupils are too hot, others too cold, and disease and debility are likely to rise from these conditions. But the most important objection is that it is almost impossible to secure an adequate change of air.

Perhaps I ought to add that the system is an expensive one. In only one room is there any scientific arrangement for ventilation. That consists of a jacket around the stove and a fresh air pipe opening out of doors and inside of the jacket. This system should be extended to all departments if our present heating arrangements are to be retained; but a more desirable improvement would be the putting in of a furnace. The hot air pipes of the old furnace are yet in their places and a little work would put the basement in shape for the heater. Experience shows that after the first cost this method of heating is much more economical than that of heating by stoves. If a furnace should be put into our building the question of ventilation would be settled and many of the difficulties and diseases due to our present unsatisfactory conditions would be done away with.

Closely allied to the question of air supply is that of the condition of the walls and ceilings. If they are rough they furnish a place for the lodgment of dust, and dust is the one piece of property on which all schools have an inalienable mortgage.

The walls should be smooth, so that dust may find as little foothold as possible and that they may be easily cleaned. Papered walls in a public building are objectionable on the ground that there is no opportunity for the diffusion of gases, that is continually going on through walls of wood or brick. The addition of paper makes them entirely impervious to air.

This diffusion of gases is no small factor in ventilation. The air comes in and noxious gases go out through the porous wood, brick and plaster. If there were some perfect method of securing a sufficient amount of fresh air in our building there would be no need of considering this question, but as that is not the case this source of purification should not be cut off. There has been some talk of papering our school-rooms, but it would seem that either painting or calsomining would be a better method. It is probable that the discussion of this paper will give us information as to the best plan.

The seating of a school-room has an important bearing on the health of the children. Great progress has been made in recent years in the perfecting of seats and desks. If school authorities would keep abreast of the times, they should adopt all the improvements possible. It is folly to say that the old fashioned seats and desks were good enough for past generations and they are good enough for the children. Such a spirit, if universal, would find us sitting on a slab bench, reading by the light of a pine knot. Such things were not good enough for us and are not good enough for our children. The best are only good enough and they are the most economical.

In regard to a seat there are several things to consider: (1) It should conform to the curves of the body. (2) It should be of a height suitable to the occupant. The dangling of feet is likely to cause distortion of the legs. (3) The seat should be single. I think all teachers will agree that intellectual considerations demand single sittings; and I think also that sanitary considerations favor the same system.

The too intimate promiscuous proximity of children in all states of health

and degrees of cleanliness is productive of much discomfort, and in many cases actual disease.

If we may believe the statements of manufacturers, the double seat is fast becoming a thing of the past. It is to be hoped that Otsego will fall into the line of progress by furnishing her school-rooms with single seats of the most approved form as rapidly as her financial condition will permit.

Our privies are constructed according to the old earth-vault system. It is unnecessary to say that they are an abomination. We know it, and our neighbors know it. So important and influential a public interest as a school, where science is taught and sanitary principles are inculcated, should lead the way in hygienic reforms. The objections to our present system are briefly as follows: The constant accumulation of excreta in a deep vault in porous soil is sure to contaminate the water courses in a greater or less degree in the course of time. The disease germs which such a pit is likely to contain may remain quiescent for a long period of years, but at last the water courses come in contact with them, carry them into the wells and so produce an epidemic. The intensely disagreeable odor which emanates from such places, especially in warm weather, is of itself sufficient evidence that they are unhealthful. The sense of smell exists for the purpose of protection. And, in general, it is safe to say that what offends our nostrils is damaging to our bodies.

Probably the most economical and satisfactory system of out-houses for small places is what is known as the "dry-earth system." This consists of a shallow vault, made water-tight by the use of water-lime in the same manner as a cistern. Dry earth, coal ashes, lime, or some equally good absorbent is kept constantly on hand, and every day a little of this absorbent is sprinkled over the contents of the vault. There should be a door in the rear of the vault through which the contents may be removed whenever it becomes necessary. If a sufficient amount of the absorbent has been sprinkled on the excreta it may be removed with as little discomfort as if it were so much dry earth. That which is removed may be used to fertilize the soil where the oxygen of the air, the chemical action of the sun, and the energy of growing plants will soon change every particle of possibly deleterious matter into harmless and useful products.

The privy should be neat and commodious and near the school building, so that children may have no motive for restraining the natural desires. This frequently happens from causes that might easily be obviated by a better system, and such restraint is productive of numerous disorders.

There are many other divisions of the subject of this paper, but I have tried to call your attention to a few of the most important. I believe the matters presented are ripe for your consideration, and I bring them before you in the hope that each point will be carefully examined and that the truth will receive your hearty approval and appropriate action.

DISCUSSION OF SUBJECT OF SCHOOL-HYGIENE.

BY PROF. DELOS FALL, MEMBER, STATE BOARD OF HEALTH, ALBION, MICH.

The general school system of Michigan provides that the child shall spend at least twelve years in gaining the education given in our primary, grammar,

and high schools. Comparing this with the commonly accepted expectation of life and it is seen that this means that more than one-fourth of the entire life of an educated person is spent within the walls of a schoolhouse. The expectation of life for the world probably falls below the usually stated figure of thirty-three and a third years; but here in Michigan, in consequence of careful attention to sanitary matters, the average man is permitted to live from 48 to 50 years. If, then, so large a proportion of the lifetime of a person is spent in the school-room it surely will be apparent that the study of the conditions of life under which these years are spent is an important one. It will be my aim to make it appear to be more important than is usually apparent to or appreciated by school officers and parents.

It is to be remembered that the child is taken from the midst of a home which has been built up in order that his needs may be ministered to in the way that will be for his highest welfare. His physical peculiarities are noted and cared for, his mental traits are well understood by his anxious and observing parents. Many of his peculiarities are by the parents overlooked as quite certain to be rectified in the subsequent life of the child, some are checked mildly and gradually, while others are met by a firm edict in the prohibition of the thing desired. The means used to bring about these ends always grow out of the intimate knowledge of the child possessed by the parents. Now he is sent to school and there finds himself in company with forty or fifty or sixty other children, no two of whom are alike, all differently constituted, each one needing a different treatment and yet placed in the hands of a teacher who is an utter stranger to the physical, mental, or moral condition of any of her numerous household.

The very statement of the case shows how utterly impossible it is for the average teacher to do full justice to any one particular child, and it also emphasizes the great need existing for the wisest plans and regulations by which in a general way the welfare of school children can best be served.

The homes from which these children come are as different in their character as are the children themselves. Here are mingled together children who have come from tidy and well kept homes with those who come from the hovel where want and dirt, disease and ignorance as to the common laws of health are prevalent. The inmates of many of these homes live on from year to year never calling in the aid or advice of a physician, or in fact any one who knows the character of the many ailments which are the common experiences of such homes. With the picture of the last mentioned home before us we shall all agree upon my third point which is this:

The school-room is the common center toward which all streams of diseases of the community tend, and from which they are spread. Great consternation to say the least comes to my home when suddenly without warning one of my boys is stricken down with some loathsome and communicable disease. Great is the mystery as to how that disease could invade a home in which all the precautions known to modern sanitary science are taken, until in the delirium of the boy's sickness he tells the story of a boy who sat in front of him at school picking off and displaying the shreds of skin from his dirty fingers, a story which at once reveals the fact that from some home had come a child before the period at which his disease could be given to others had passed, and the incident is a clear demonstration of the proposition which I have made. Further than this, it follows that as a natural consequence of this condition of things, not

only is my boy exposed but the children from all the homes that may be represented in this school-room are also exposed to a contagious disease and an epidemic of that disease breaks out. Do you not see that the school-room should be guarded carefully from the possible entrance into and passage from it of these dreadful contagious diseases?

Another fact bearing upon this same thought is that susceptibility to disease is in inverse proportion to age, that is to say the younger the person the more easily is he affected by abnormal conditions. A strong vigorous man may go, without immediate harm, into an atmosphere charged with poisonous gases, the very vigor of his body making it easy for him to throw off any deleterious effects produced by it. The child's constitution, on the other hand, cannot resist the action of such an atmosphere. This brings us to several important conclusions, namely: (1). Sanitary reform ought to begin in the school-room. (2). Large responsibility in this matter lies upon the shoulders of school officers. (3). Other great and important responsibilities are in the hands of the superintendents and teachers of the schools.

The responsibility of the school-board lies mainly in the construction of a building, the choice of a proper site, the construction of wells and so forth. The responsibility of the teacher lies in the proper use which he makes of the appliances placed in his hands.

What shall be the style of the architecture of the school building which shall give the best sanitary results? This question is too often answered by the public spirited citizen who thinks of this building as an addition to the ornaments which go to make up the town in which he lives. He demands that the schoolhouse shall be placed where it can best be seen by the public, that it shall be tall and stately, possessing those architectural elements which are recognized as forming an imposing edifice.

He considers of secondary importance those questions which really ought to be asked concerning the style of the building. For example, how many stories high shall this building be? The citizen has already answered it from his standpoint. Answered from the standpoint of Sanitary Science it shall be a building with as few flights of stairs as possible. How large shall this building be? The public citizen measures the size of this building by the amount of money he thinks can be raised by a tax which will not be a burden upon the town. Answered from the standpoint of Sanitary Science we shall say that this building shall be large enough so that every pupil shall have at least 300 cubic feet of air-space, whether it costs little or much. How shall this building be warmed? The taxpayer answers, by a system which shall be the most economical possible. The answer from the Sanitarian is, that it shall not only be properly warmed but also properly ventilated. Now, ventilation is never properly secured except at the expense of heat, so that I utter a truth when I state this proposition: that to secure sufficient warmth and at the same time proper ventilation it must be done in a measure without regard to cost. The taxpayer insists upon cheapness. If the welfare of the children is to be consulted proper warmth and ventilation must be secured at whatever cost.

A few sample principles concerning ventilation may not be out of place at this point. We have said that each scholar should be provided with at least 300 cubic feet of air-space. This means that if the length, breadth and thickness of a room be multiplied together and be divided by the

maximum number of children who are to occupy the room, the quotient ought not to be less than 300. Take another view of the case: each person should be supplied with at least 2,000 cubic feet of fresh air for every hour that the room is occupied. Take another: each person throws off from the lungs one-half cubic foot of carbonic acid gas each hour, so that the number of scholars, multiplied by the number of hours that the room is occupied and this by one-half, will give the number of cubic feet of carbonic acid gas left in the room, provided there has been no ventilation. The ratio of this number to cubical contents of the room ought not to be more than one to five hundred. For example, if this room is 36x40 and 18 feet high, it contains 25,920 cubic feet. Now if the room is occupied by sixty scholars for three hours there will be present in the air of this room ninety cubic feet of carbonic acid gas, with its accompanying organic poison. The ratio of 90 to 25,920 is 1 to 288, a condition which brings the air within very dangerous limits. Scholars go from this room with headache, weariness, lassitude, with impure blood passing the lungs without being purified for the lack of the oxygen which the air does not contain. What is needed is ventilation, and ventilation at any cost. Let it be repeated,—three things cannot be secured at the same time, namely, heating, ventilation and little cost. We may heat economically, we may ventilate economically, but to secure them both at the same time the latter must be had at the expense of the former, and hence the cost is increased.

How shall this building be lighted? Here the citizen interested will stand on the outside and deliberately resolve upon the form, number, and position of the windows solely from that standpoint. The Sanitarian insists upon window space at least to the amount of one-fourth the floor space. The light should be so directed as to strike upon the printed page and not into the eye of the scholar. Neither teacher nor scholar should stand facing the light.

THE CAUSES AND PREVENTION OF CONSUMPTION.

BY H. L. MILLER, M. D., OF OTSEGO.

To my mind the study of consumption is one of the most important in the field of health and hygiene. When we fully appreciate the fact that about one-eighth of all deaths are attributable to consumption, the statement I have just made will be readily conceded.

Numerous causes of this dread disease have been advanced by prominent authors and pathologists. The question which is engaging the leading minds to-day, is whether consumption is infectious or not. The weight of opinion seems to be in favor of the theory that it is infectious; on the other hand, quite a respectable body of able thinkers and scientists contend that it is not infectious. Both factions are able to bring strong evidence to substantiate their theories.

The settling of this great question is looked forward to as a very important factor in our battle with this destroyer of mankind. If consumption is infectious, then the indications are clear and distinct, that the patient must be isolated and every possible precaution taken to prevent the spread of the

disease. I will repeat the statement that it is claimed by some that consumption is infectious, and by others that it is not. It seems to me that this divided opinion is due to the probable fact that there is more than one form of consumption, that there is a form or variety which is tuberculous, and when such is the fact, there is but little doubt that it is infectious, for whenever tuberculous matter has been put to the test, it has always been able to reproduce itself, to grow, develop and destroy. I should have said, nearly always, for there are conditions under which it seems to lose its power of infection. On the other hand, there is a form of consumption which may not be tuberculous, at least this is the history of a large number of cases which have given all the physical signs and symptoms of consumption, and yet from actual experimentation, we find it is utterly impossible to infect living animal organisms with the disease. This form seems to lack the specific germ of tubercular consumption, and cannot infect another, but is consumption nevertheless.

Without further argument I take the ground, that consumption is a double headed monster, infectious and non-infectious.

I will now give you a brief summary of the causes of consumption.

HEREDITY.

The offspring of a parent suffering from consumption at the time the child was conceived, is predisposed to the disease. Whether the parent was tuberculous or not, the child will be weakling, however strong and robust it may appear, it will have a strong predisposition to not only contract consumption, but all forms of disease prevalent in the community. But if the disease is tuberculous the child stands but little chance of living to its fifth year, as we will endeavor to show by giving a few cases from observation.

I select nine cases from record,—all women and mothers, varying in age from twenty-two to twenty-five years, all of whom gave a family history of consumption. I select these cases because they were all fatal cases, they all died within four month after the last confinement of each, of tubercular consumption of the lungs. Seven of these children died before they reached the age of twenty months. These cases furnish strong presumptive evidence that tubercular consumption may be hereditary, and indeed the question is not much doubted at the present day.

Heredity, as the cause of consumption, was once thought to be the rule, but practical experience has proved the rule to be the exception.

If we admit that consumption is hereditary we must of necessity admit that it is also infectious. The tuberculous matter itself is (or includes) the specific, morbific matter of the disease, and when present in consumption, constitutes the material by which the disease is propagated from one animal organization to another.

Now we will consider some of the channels through which infectious matter may be conveyed. The specific germs may be communicated to the lungs and respiratory passages during the act of respiration; this is most liable to occur under certain conditions, such as, when the nurse or anyone is confined in a poorly ventilated room with the consumptive, when they occupy the same bed, sleep in the same room, and breathe the same vitiated atmosphere over and over again.

Infection by means of respiration rarely occurs when the patient sleeps

alone, when the room is kept well ventilated—when the attendants are in good bodily health and open air exercise is indulged in. It is undoubtedly true, that a person in robust health can withstand the *bacillus tuberculosis* inhaled into the lungs, or taken into the stomach. Another source of infection is undoubtedly through eating diseased meat, or meat infected with tubercles or drinking milk infected with the same material.

Dr. Cressy in the report of the Connecticut State Board of Health, for 1880, says:

"Nowhere in the struggle of life against the manifold causes of disease, do we more effectually imperil our health and happiness than in partaking of animal food of suspicious character; the meat from cattle affected with tuberculosis is not unfrequently found in our American markets, especially in our large cities. Such infected meat should not be used, for it is surely a dangerous article of food."

Before I take up the question, "What can be done to prevent the alarming spread of this disease?" I desire to give a few illustrations:

The first case gave a history dating back more than twenty years; she had been examined by a number of physicians who invariably pronounced the disease *phthisis pulmonalis*. Her husband had been her principal attendant, and for the first fifteen years he occupied the same room and bed. So far as I am able to discover, there is not the shadow of suspicion that any one was infected by association or communication with this patient. They were people who believed in pure air and plenty of it. Plain nourishing food, and out-door exercise, with them, were subjects for constant consideration.

The reward was comfort and a prolonged existence for one, and robust health and what it brings, for the other.

The second case gave a family history of tuberculosis, and for ten years had complained more or less of impaired respiration when walking fast, climbing hills or ascending stairs; otherwise he appeared in good health. One August he contracted a severe cold, numerous symptoms immediately appeared referable to pulmonary embarrassment; the following July he died with every symptom of tubercular consumption of the lungs. During his last illness his wife was in constant attendance upon him. She was never in robust health, gave little attention to the protection of the body from changeable weather, from cold winds, dampness, etc. She contracted a cold, had an attack of bronchitis, and in four months died of consumption.

In this case we had a debilitated constitution, a tendency to catarrhal difficulties, and the exposure to tubercular sputa; the result is infection and death.

I select these two cases from a large number of similar ones of which I have a record. The history of these cases is almost invariably the same—the strong and robust escape the poison, the weak and debilitated succumb.

There is no doubt in my mind that there is a form of consumption which is not infectious, possesses no specific poison, and, is not communicable. It is usually preceded by some form of catarrhal affection as catarrhal pneumonia, catarrhal and suppurative bronchitis, etc. These in brief are some of the most important causes of consumption.

There is but one method by which to deal with heredity. Consumptives should not marry. To prevent the spread of the disease by infection when

that is possible, the patient should be quartered in large well ventilated rooms, and be out of doors as much as possible. The attendant or companion should be a person in robust health, though disinfection should be practiced, and the hygienic laws in reference to pure water, pure surroundings, and especially pure air should be enforced.

To prevent infection from tuberculous meats, milk, etc., rigid sanitary regulations should be adopted, and sanitary officers appointed, to enforce the regulations. An effort in this direction is on foot and our government should be liberal in its appropriations of funds for the purpose of experiments.

By far the larger number of cases of consumption probably owe their origin to some form of inflammatory disease.

By far the larger number of this class of cases are of people who follow an indoor occupation, such as book-keeping, teaching, clerking, etc., confined to a warm room, often bad air, and wearing insufficient clothing, the system becomes debilitated, they contract a cold, abscess of the ears, catarrhal disease of the throat, catarrh of the lungs—quick consumption, and speedy death follows.

What is the remedy? It can only be found under the head of prevention. Be regular in your habits, use all your spare time in developing your muscles, in expanding your lungs, in gymnastic exercises; throw back your shoulders, lift your head erect and take in an abundance of God's pure air. The feet should be well dressed, shoes or boots should be worn which keep the feet both dry and warm. I believe, the overshoe, the rubber and the rubber boot are a decided damage to health; rubber effectually keeps the air from the skin. You wear them until the skin becomes wet from perspiration, you pull off the rubbers, step out doors for a moment, and that moment is sufficient to contract a cold, and the result cannot be foretold. Then I will repeat: keep the body dry, thoroughly protect your chest, and live as near a right line of health as possible. Look well after catarrah of the throat or bronchial tubes, for they are frequently the precursor of consumption.

THE CAUSES AND PREVENTION OF CONSUMPTION.

DISCUSSION BY HENRY F. LYSTER, M. D., MEMBER OF THE STATE BOARD OF HEALTH, DETROIT.

(*Reporter's abstract.*)

I am firmly convinced of the contagiousness of consumption. Those forms of consumption which are not contagious at first may afterwards in the latter stages become so. Though it has not been the popular impression that consumption is contagious, of late years it has been so regarded.

More women die from consumption than men; wives get the disease from constant attendance on consumptive husbands. Man is not so apt to catch it because he is not so devoted a nurse. It seems too bad that woman is not exempted from punishment for this devotion.

Only in recent years pathologists have discovered the specific cause of consumption—the so-called bacillus tuberculosis of Koch. By many experiments it has been found that tuberculosis can be inoculated. When the eye of a rabbit is inoculated with this germ the rabbit is soon found to be infected. Other rabbits inoculated with non-tubercular matter are not infected.

Other animals are less susceptible. Dogs are not particularly likely to die of consumption, but when 11 dogs were subjected to an atmosphere of vaporized sputa of tuberculosis, tubercular deposits were found in the lungs.

Italians for a long time have considered the disease contagious.

A French writer tells of a man and wife and four children who went into a room occupied by another family where one had consumption. The oldest girl only staid one day, while the rest were kept several weeks. In three or four months all the children died from consumption. The oldest girl died in four or five months. A London writer mentions a tinker who moved around and slept in his wagon. He died of consumption, some one else took the cart and died of consumption. Indeed two or three others who tried the cart all caught the consumption.

I have seen many cases of consumption in University clinics without any hereditary taint. The tendency to contract quick consumption—acute milliary consumption—is frequently hereditary. The tendency in nature however is to revert to a correct type—to eliminate a deterioration such as insanity or a tendency to tuberculosis.

I agree with what has been said concerning school hygiene. As we get older we feel like giving the children a good chance. The environment of children is important in eliminating consumption. If they are properly trained, there is a tendency to throw off tuberculosis. Give a student good air and other good surroundings and he is better able to withstand the weak hereditary strain.

On the other side of the water they don't open windows. The Germans are horrified at the idea of opening windows, the result is a large amount of catarrhal difficulties.

I agree with Prof. Fall in desiring a continuation of the recess. If it is too stormy and there is a danger of catching cold the scholars might not go out, but they should have a recess and a chance to obtain some fresh air.

Bad air comes not altogether from the breath, but also from the clothing of the children. In the cities there are better odors in the best precincts than where the poor children are.

Third Session—Friday, May 3, at 10, A. M.

The third session of the Convention was called to order by the President. After prayer by Prof. Fall, and two pieces of music by the high school students, Arther Hazlewood, M. D., of Grand Rapids, member of the State Board of Health, discussed the subject of the "Disposal of Excreta and Waste in Otsego."

DISPOSAL OF EXCRETA AND WASTE IN OTSEGO.

DISCUSSION BY ARTHUR HAZLEWOOD, M. D., MEMBER OF THE STATE BOARD OF HEALTH, GRAND RAPIDS, MICH.

(Reporter's Abstract).

Let us first consider what substances may be classed under excreta and waste. All animals give off from the body excrementitious matter which is poisonous to that individual, not only by every breath but by perspiration, by the skin itself peeling off in scales, besides what is ordinarily known as excreta. Waste includes the excreta and other matters. Housekeepers and cooks have large quantities of material which is not good food for men or pigs,—soil water, ashes, old clothing, etc.

Aborigines make a camp over night, and leave the refuse behind them, and nature takes care of it. This is not possible in communities where many remain year after year.

In the first chapter of Deuteronomy is the first description of an earth-closet. The necessity of covering excreta was then recognized.

All nice appliances for disposing of excreta are expensive. It is better to expend less money on house decorations and more on water-closets and other necessary appliances.

Here it might be possible to introduce a system of water-carriage for disposing of excreta. The most automatic process is the sewerage system. You may not yet be ready for such a system. When houses are far apart, it is at a considerable cost. But you can introduce the dry-earth closet without much cost. This system will not take care of itself. It is necessary to make a trough, lined with cement and perfectly water-tight. Every time it is used the excreta should be covered with sufficient earth to bury it,—with a pound or two pounds of earth. It should be removed after a month's time, and may be deposited anywhere, distant from wells or other sources of drinking water, without unpleasantness. You can not dispose of much liquid this way, and it is better to sprinkle the wash water over the surface of the earth, though at some risk.

Rubbish in a town of this size will accumulate. This should be burned. In small towns the bonfire should be a permanent institution. In large cities the waste has become so troublesome that furnaces have been constructed to get rid of it.

Prof. Delos Fall, member of the State Board of Health, Albion, Mich., in the discussion of this subject, said that though there was nothing clean about the subject, it was the thing that was unpleasant and not the discussion of it. It is a practical evil from which we are suffering, and if we could settle the question so that we could live under better conditions in the future, this discussion would pay. He hoped the time would come when the community would generously vote money for sewers.

Four rods by six is the ordinary city lot, and on that little spot slops and the excreta from the body must be disposed of, and the well must be situated. Necessarily they must be quite near together. We construct cess-pools, and congratulate ourselves that we have disposed of our slops. But where there is no trap, what will prevent sewer gases from rising into the

house. Another puts in a chimney to the cess-pool so that the gases escape, but they are constantly rising and entering at open windows. If you must have a cess-pool, make the ventilating shaft as high as the house.

Dig down five or six feet from your cess-pool and you find that you have a cess-pool out there, thus showing how the soil is contaminated.

The dry earth closet system is perfectly practicable, and the care of them is no more unpleasant than many other duties. Three minutes once a week cares for a dry-earth closet, and it is not expensive.

A. Arnold Clark then gave an unwritten address on nuisances, of which the following is the substance:—

NUISANCES: WHAT THEY ARE AND HOW TO ABATE THEM.

BY A. ARNOLD CLARK, LANSING, MICH.

The law relative to the abatement of nuisances rests on one of the most fundamental principles of government: Every man shall so use his own as not to injure another in the enjoyment of his rights. We call government a "social compact." In the savage state society is a jungle for wild beasts, in which every rattlesnake has an inalienable right to bite, when life is a battle—a struggle for existence. Society is organized to do away with this struggle and to guarantee to all equal rights. We form a social compact. I give up my liberty to murder you and you give up your liberty to murder me. Your hobby may be a hog-pen, another's a cess-pool, mine a slaughter-house, but we mutually give up our liberty to injure one another with our hog-pens, cess-pools and slaughter-houses.

Strictly speaking, any use of property annoying to another's rights is a nuisance. Two things are necessary: a right and an injury. No matter how much your refined taste may be violated by the architectural structure of your neighbor's house, it is not a nuisance, because no right is violated. So I may not like the looks of your pig-pen, but I can look the other way. When, however, your pig-pen gives off offensive odors it is a nuisance, because every man has a right to pure air.

There must be not simply a violation of a right to constitute a nuisance, but the violation of the right must make somebody uncomfortable. One can not urge that he is especially dainty or fastidious, but any use of property which renders uncomfortable a plain ordinary American is a nuisance. The nuisance need not be injurious to the health; it is enough if it is annoying to the senses.

Nuisances are sometimes classified as public, private and mixed,—the latter being a public nuisance in which some private person is entitled to special damages for some special injury.

Nuisances are also classified as (1) nuisances *per se*—in themselves, and (2) occupations which may become nuisances through negligent or improper use. Decaying matter is a nuisance in itself; a slaughter-house may become such because of its improper location.

Most nuisances may be classified as violations either of our rights to pure air or pure water. Every man has a right to air uncontaminated by

noxious vapors, odors, and noises. Among the trades which under certain circumstances have been declared to be nuisances because of the contamination noxious vapors may be mentioned:

Bone mills, chemical works, veterinary stables (where horse's hoofs were burned), dye houses—all legitimate occupations but carried on so near dwellings as to interfere with rights to pure air. The courts have held that a blacksmith's shop was a nuisance when the cinders discolored well-water and entered an adjoining house; glass works are nuisances when the smoke from them produces an unpleasant taste in the mouth, also lead works and breweries which give off noxious vapors. If a neighbor is cultivating foreign plants, smoke which destroys them is a nuisance even though this smoke is not injurious to ordinary vegetation.

Among those occupations which are nuisances because of the offensive odors which they give off may be mentioned:

Tallow factories, soap factories, tanneries, boiling carrion, pig-pens, vaults, cess-pools and slaughter-houses. A slaughter house located in the suburbs of a city may not be a nuisance, but if the city grows out to it it may become one.

Dust in the air may become a nuisance, also a hospital located in a public place. Livery stables may become nuisances because of offensive stenches, the collection of flies, or the noise of the horses' feet.

Thus we see that our rights may be violated by noises. Dogs barking at night, the shop of a tinsmith who works nights, discharging guns, singing at unreasonable hours are nuisances. If your neighbor "blows on a cracked clarionet" it is a nuisance. Brass bands and whirligigs have been declared to be nuisances. You see how careful the courts are to guard the rights of man to air uncontaminated by vapors, odors, and noises.

Every man has a right to pure water. Polluting rivers used for drinking purposes by refuse from mill, brewery, or sewer is a nuisance. It has been declared a nuisance where the contents of a vault percolate into a neighbor's well.

Every year many complaints of nuisances are received at the office of the State Board of Health. During the year for which the last report was issued, there were 26 such complaints. These complaints are mostly of slaughter-houses, privy vaults and manure piles. I recollect one instance of a horse stable which was only twelve feet from a man's dining room window, the manure pile was only three feet from the window and 16 feet from the well. That man was not happy. He did not like to have his dinner flavored that way. He thought "of all the smells he ever smelled smell, he never smelled a smell smell as that smell smelled." Now a manure pile is not in itself a nuisance, but it may be located so near a residence (as in this instance) as to become one.

But the largest number of complaints at the office of the State Board of Health relates to this subject which you are today discussing, viz.: The Disposal of Waste. Unquestionably the privy vault is a relic of barbarism. You may not now notice any evil from this pollution of your wells, but wait until the germs of typhoid fever find their way into these vaults and then into your wells, and a great epidemic may teach you how your soil is honeycombed with this contamination. Now the local board of health has a right to make regulations declaring all privy vaults in this village nuisances, to order them

disinfected with chloride of lime, filled up, and to substitute in their stead the dry-earth closet. Some villages have passed such regulations.

This leads me to say that the abatement of all nuisances (where there is a plain remedy at law) rests with the local board of health. The local board is required by law to examine into all nuisances and to destroy, remove or prevent them as the case may require. If the nuisance is found on private property, the owner should be ordered to abate the nuisance, at his own expense, in twenty-four hours. If he fails to do so, he forfeits a sum of $100.00, and the board may have the nuisance removed, if necessary, by the forcible entry of private property.

As I said before, some nuisances are nuisances *per se*, others are made so under certain conditions by statutory provision (In Michigan a slaughter-house within 20 rods of a public highway is a nuisance), other nuisances are made such by city ordinance and others may be declared nuisances by regulations of the local board of health. But before a local board of health can abate such a nuisance it must publish its regulations in a newspaper or post them in five public places. But it may not be a nuisance just because the local board of health says so, and where the owner refuses to obey the orders of the local board and the destruction of private property is called for, it is a safer course to enter complaint before a circuit court and secure a judicial order for the abatement of the nuisance.* If the local board of health neglects to make such complaint anyone who is injured may do it.

I think there can be no question that as nations have become cleaner they have become healthier. I know there are some who say they have always breathed bad air, drank bad water and are still alive, like the man who refuses to get his life insured because he always has lived.

Today the death-rate from typhoid fever in London is only one-fifth what it was before 1860, when that city did away with its old nuisances and adopted its present sewerage system. The death-rate in the city of Chicago was nearly twice as high before the introduction of a good sewerage system as it is now.

In the seventeenth century the average duration of life was twenty-four years. The seventeenth century! When, as Pascal has said, disease was the normal state of Christians; when men used to boast that neither they nor their ancestors had taken a bath for a thousand years. In the eighteenth century the duration of life had increased to twenty-nine years, while at the present time the average man may hope to live forty-nine years, and Prof. Flourens, and others, tell us that if we lived properly we ought to live to be 100 years old.

I have thus spoken of the ordinary nuisances, because this seemed to be required, but I must allude in closing to another kind of nuisance which must be abated in a different manner. The researches of modern science have taught us that water and air are contaminated by other things than refuse, vapors, odors and noises, and though it takes a microscope to find them they are more dangerous than a tannery or soap-factory. I refer to the specific germs of disease which abound in the water we drink and the air we breathe, which find a hiding place in our garrets and wells, which linger in our hair and clothing, which abound in crowded rooms and which cause over half of all the deaths which occur in this State. Scarlet fever

*"The circuit court for any county shall have equity jurisdiction in all matters concerning nuisances, where there is not a plain, adequate and complete remedy at law, and may grant injunctions to stay or prevent nuisances."—§ 7965, Howell's Statutes.

does not come from manure piles and slaughter houses, but from the germs of a previous case. It is more important to destroy the germs that kill than the manure piles which annoy. When you can keep the germs of fermentation out of your cans your fruit does not ferment, the germs do not develop spontaneously in the can. So the germs of contagious diseases no more arise spontaneously in the air out of nothing than birds do. It was formerly thought that these diseases came from these ordinary nuisances such as manure piles, but now all this is a thing of the past. A field full of thistles is an indication that the seeds of thistles have been wafted there, and as you can't gather figs from thistles, you can't get measles from anything but measles. There was no scarlet fever in this country until the germs of the disease were brought here from a previous case over two hundred years ago, and if all the germs of scarlet fever in the United States were destroyed tonight scarlet fever would again be a disease unknown. These living germs of disease in the air we breathe and the water we drink are the great nuisances which local boards of health should destroy.

Over a year ago a man sick with typhoid fever went to Iron Mountain, Michigan. In a few days he died. The dejections from this patient were not disinfected as they should have been, and in a short time the water-supply of Iron Mountain literally swarmed with the germs of this dreadful disease. There were three hundred and fifty cases and thirty-five deaths as a result of this one case. Undoubtedly the man who first contaminated the water-supply of Iron Mountain created a nuisance, but how could you abate it in the ordinary way after the man was dead and the water-supply was contaminated. The germs might have been killed at the start by proper disinfection. This not being done, every citizen in such a case has a remedy in his own hands, because boiling the drinking water will destroy these germs. Let me impress upon you the value of this simple precaution. If your local board of health refuses to prohibit the privy vault system, and your neighbors continue to contaminate your wells, by boiling the water you drink you can abate this typhoid fever nuisance yourself.

Now, if every man has a right to pure air and pure water, and that is a nuisance which interferes with this right, these germs are nuisances and they should be abated. I trust that my point is understood. All nuisances should be abated. Our lives should not be made uncomfortable by vapors, odors or noises, but, as the most uncomfortable thing which can happen to a man is to die, the most important work of the local board of health is to destroy those germ nuisances which contaminate the air we breathe and the water we drink in a way not only annoying to our senses but detrimental to health and destructive of life.

DISCUSSION.

Henry B. Baker, M. D., Secretary of the State Board of Health, was asked if the manure pile was especially dangerous to health, and in reply thought that as a cause of sickness, the manure pile ranked very low, but it was an unpleasant feature. There is not much accurate evidence; but Dr. Joseph Fodor, of Buda Pesth, has collected facts covering a period of fifteen years, 1863 to 1877, in that city. He classified the premises where the lots were "clean," "very clean," "dirty," and "very dirty," and he shows that the filthy localities suffered much more from cholera and from typhoid fever

than did the clean ones. The death-rates from these two diseases increased from the "clean" to the "very dirty" with great regularity.

Dr. Baker also said in response to another question as to throwing slops on the ground, that it was better to spread them out as much as possible so that they might be quickly oxidized. There was a question as to what extent the oxidation of the disease germs could occur, and it was safer not to rely upon it, but to use chloride of lime in all cases where a dangerous disease like typhoid fever is present.

The Secretary of the convention here read a communication to the convention complaining that the bark peeled from logs from a saw-mill had been placed on the public highway in a rotting and decaying condition and that the smell from them was nauseating and unhealthful, and stating that the commissioner of highways had given a rebate in road tax for this bark.

Hon. John Avery, M. D., President of the State Board of Health, made a few remarks relative to the subject of the petition, stating that it was quite common to use the refuse of mills to fill up low places. Large portions of our largest cities had been built up in that way and by sawdust. If the commissioners of highways would cover the bark with gravel a foot deep it would benefit the road, but a better way would be to burn up the bark and put the gravel on the sand.

H. L. Miller, M. D., of Otsego, thought the prevention of cholera infantum as important as the prevention of typhoid fever. It was his opinion that feeding cows on barnyard refuse caused cholera infantum. He had recently had a case of cholera infantum where the milk had been changed to that from a cow fed on slops and in 24 hours after the change the child was taken sick.

Prof. Delos Fall, member of the State Board of Health, made a few remarks as to the impossibility of a cow elaborating pure milk out of impure food.

On motion, Prof. Osinga was tendered a vote of thanks for the presence of the students from the high school.

Fourth Session—Friday, May 3, at 2:30 P. M.

The convention was called to order by the President. After music by the Glee Club, Milton Chase, M. D., of Otsego, read the following paper on the "Present and Future Water-supply of Otsego."

PRESENT AND FUTURE WATER-SUPPLY OF OTSEGO.

BY MILTON CHASE, M. D., OF OTSEGO.

The topic of present and future water-supply of our village has been assigned to me.

When I consented to prepare this paper I felt sure the act would not be one of unmixed pleasure. I felt sure that I would be compelled to narrate facts from which the inevitable deductions would be that some of our citizens are disgustingly filthy about their drinking water. That some of our people are committing suicide and manslaughter and will be mad at me, for

telling them of it, to cover up the disgust of their own stupidity and carelessness. I shall not name persons nor designate block or street where wells are most filthy, but I shall give rules by which they may be found. The drinking water of this village is derived from wells that reach into a common pond or lake that underlies this village. There are 60 drive wells and 150 dug wells in this village. Fifty of these are open wells with buckets or hook. The drive wells have pumps of iron; some two or three flowing wells. By far the most of the pumps in dug wells are wooden ones. There are 18 or 20 chain pumps in the village. There are a few families that drink cistern water among us. Thirty houses have no wells on the same lot on which they stand. The drive wells are from 18 to 60 feet deep, few are at either extreme, most are from 24 to 30 feet deep. The dug wells are from 10 to 30 feet deep. I think none of the wells north of South street are in or pass through clay beds. The ground is variegated as to sand, quicksand, loose gravel, running gravel and cemented ground or hardpan. There is a common level for the water under this village, yet in the various makes of spots of ground there is great variation as to the rapidity with which water will run through the soil. Dig two wells on my lot within 20 feet of each other 18 feet deep, and one will have six feet of water in it in six hours and the other would take six days to fill in that much. One could be readily pumped dry and the other would be very difficult to exhaust. This statement is made on experiment. Probably many other places are like constituted. Some wells will be very slow to fill from the common pond under the village at its level, and would be slow to be contaminated from the common pool. This is no truer of a drive well than of an open one. Some of the wells seem to have a spring in them. Some seem to have a stream of water with an appreciable current running through them, and this would have a resistance to the contamination of the wells by water from the common pond under the village.

There are 200 privy vaults in this village that are percolating human excreta into the common pond of water under this village. Organic chemistry is a science of itself that has made nearly all of its great and important growth since my school days. Within a very few of the years last past there have been discovered chemical bodies or compounds called ptomaines that occur in the destruction of animal bodies and in wastes or excretions of animals that are as poisonous in small quantities as are strychnine, arsenic, nicotine, or prussic acid, some of them much more poisonous than the worst I have mentioned. The human excretions from kidneys and bowels in health and more so in disease have some wonderful poisonous ptomaines. Two hundred privy vaults in a year can dangerously contaminate a great many millions of gallons of water. If one grain of strychnine raised to the 400 dilution in a homœpathic pharmacy has any potency, then one of our privy vaults will surely appreciably vitiate all the water under this village. I find in this village ten privy vaults within 20 feet of wells and some of the vaults have been continuously used for more than ten years. Some of these houses always have sick persons in them and are known as unlucky houses and nobody lives in them long, for they move out or die out. Fifty wells have privy vaults within 30 feet of them. Only 80 houses have privy vaults more than 60 feet distant (not considering privies that have no vaults). Privy vaults at a distance of less than 60 feet from a well are a source of danger to those wells and the danger increases as

the two approximate. When nearer than 20 feet to each other there is no doubt of danger even if the well is a drive well.

Some of our citizens are deluding themselves by believing that ashes and lime put in privy vaults will neutralize all the poisons in them. It is a delusion and a snare that will result in death. The marketable disinfectants,—the copperas, crude carbolic acid, and all of this class of goods are misleading the public and doing lots of harm, robbing many a household of its priceless jewels. The paddle of the Jews used as directed by Moses when they were in the wilderness would be better today than ashes, lime, chloride of lime and the whole boodle of them.

I am sorry that I do not have the chemical material to analyze the water in the wells of this village or the money to hire it done to use in this convention, because then this essay would have more of the positive in it. The water-supply for fire purposes and lawn and garden use and to allay dust, is a new thing to us. Its use may be fraught with some danger. It comes from the Kalamazoo river through the race. The danger will come from its use to allay dust and grow lawns if it comes at all. I think it will be a factor in the causation of disease among us, but not a very large one. About our houses it will be converted into vapor and taken into our bodies through our lungs and skin and the vapor may carry with it some of the filth of the river to our interiors to make us trouble.

The method of taking water from wells probably has an influence on its healthfulness. Buckets drawn with ropes always contaminate the water with fibers of the ropes as always can be seen by holding a glass of water in clear sunlight and looking through it. Wooden pumps furnish wood fibers to the drink. These fibers will always have roosting on them countless animals that may or may not be good for food. I do not think either of these methods of getting drinking water out of a well a good one. I believe an iron pump galvanized is better than the other three methods.

I am not sure that we need to abandon our wells in this village for a hundred years unless we shall have over 4,000 people in our present corporate limits. I do believe we should abandon entirely privy vaults in the village and dispose of the excreta in some other way. I believe that there should be a stop to the habit of emptying kitchen slops on the ground within 30 feet of a well. I have not studied out how we shall get our future water supply, for I expect that as long as I live it will be as it is now, from wells and river. I hope and expect that we will lessen the dangers to our present supply of water and that we will contrive to be as we now are, among the healthiest villages of Michigan.

DISCUSSION.

Prof. Delos Fall, member of the State Board of Health, in opening the discussion, said that if the people of Otsego were likely to drink poison in their drinking water it was better to know it and to discuss it. The average rainfall in that locality was nearly three feet. Should it all fall at once it would be a lake. There is on this hard pan beneath us a subterranean lake from which we get our water supply. Where does it come from? The clouds. How does it reach this lake below the ground? By passing through the filth of which we spoke this forenoon. There is a vast difference between waters. Most of the wells are from twenty to thirty feet deep and we drink the ground water which comes directly through this contamination. If we dig deeper we obtain water which has been carried a longer distance and is likely to be purer.

Through how great a distance will these dangerous elements in the water go? A few years ago the Village Board of Richland, Kalamazoo County, chose a new site for a cemetery within thirty rods of a well owned by Dr. Upjohn. Dr. Upjohn objected and the result was a lawsuit. The water

of this well was tested for lithium and it was found that it was absent. A salt of lithium was then sown over the cemetery grounds and on the eighteenth day afterwards the lithium was found in the water of the well, showing that the water which fell upon the cemetery did pass to the well. To a little village in Switzerland (Lausanne) the germs of typhoid fever were carried through a mountain, as was proved by observation and experiments.

The water itself is not poisonous, but the germs of disease such as typhoid fever are the dangerous elements. These germs find their way from privy vaults into wells. That is to say, we have here in Otsego the conditions for the propagation of all such diseases. We thus see the necessity of protecting our water-supply.

Arthur Hazlewood, M. D., member of the State Board of Health, in the further discussion of this subject, emphasized the fact that the boiling of the drinking water would destroy these germs and make the water safe to drink.

Dr. Chase inquired whether there was liability of the wells of Otsego being contaminated by the cemetery.

Dr. Baker replied that, judging from the apparent structure of the hill, he thought that the wells between the cemetery and the river were unsafe, especially if bodies of those dead from typhoid fever were placed in the cemetery.

Professor Fall stated, in response to the question whether filling up the vaults would put an end to the danger, that the vaults should be dug out and the contents carried to some distant field, and the vaults disinfected.

Dr. Baker, in response to a question as to whether the cremation of the dead was desirable, said that it was desirable from a sanitary standpoint. He also stated that in the disinfection of the privy, four ounces of the best quality of chloride of lime should be used to each gallon of material in the vault.

Professor Fall, in response to a question whether making the vaults water-tight with cement would not insure their safety, spoke of the dry-earth closet plan as probably the best for the disposal of excreta in a village the size of Otsego.

Dr. Baker said, in response to a question, that the artesian well was the safest of any for a public water-supply for Otsego.

Professor Osinga thought there should be some way of impressing on the citizens of Otsego the necessity of doing away with privy vaults, and substituting in their stead the dry-earth system.

On motion of Dr. Baker, it was unanimously voted that Professor Osinga be requested to prepare for the local paper a statement setting forth the advantages of doing away with the present vaults and substituting in their stead the dry-earth closet system.

Fifth Session.—Friday, May 3, at 7:30 P. M.

RESTRICTION AND PREVENTION OF COMMUNICABLE DISEASES, FROM THE STANDPOINT OF THE LOCAL HEALTH OFFICER.

BY L. E. CLARK, M. D., OF OTSEGO.

The subject of my paper as announced, is the restriction and prevention of communicable diseases from the standpoint of the local health officer. Hence we infer that there is such a position to be filled in a community as that of the local health officer.

Then first, let us understand who he is and how he is admitted to bear the honored title. The health officer of Otsego is appointed by our village board, and being duly sworn in he is equipped for the office. In years gone by, it was thought that such an office should be filled by mean men, but more modern themes and theories have much changed the erroneous idea,

though many of our own citizens today think that the health officer should have no place in society whatever; but, before we finish our paper we intend to picture to your minds at least, the essential necessity of the health officer. We wish to have the health officer known from a sanitary standpoint as scientific principles bear us out, as he is known by his record in statistics or, at least in the compilation of statistics, for the benefit of all humanity; for it is through the local health officer that our State Board of Health is reached, and by them outbreaks of contagious diseases all over the State are made known, inasmuch as they furnish the local health officer blank cards with a list of diseases, 28 I think in all. These are blank reports. The health officers throughout the State every week are expected to fill out one and return it to the State Board of Health at Lansing; by these reports you can see how diseases dangerous to public health are kept track of; where they are the most prevalent, as well as most malignant; where scarlet fever is, where diphtheria is, and the scores of persons it is slaying daily in spite of all our science, because of the ignorance and want of care and restriction when the outbreak is first made manifest. For instance, an outbreak may occur here in Otsego, and if no restrictions are placed upon it, it marks its own way; but place restrictions upon it and see how very rapidly it disappears. We all well remember the several outbreaks of scarlet fever, yes, and of diphtheria also of late years here among us. Had we any fatalities? None. Let us compare these with the outbreaks of 12 or 14 years ago. Were there lives lost then? Indeed there were. True it is we know more of disease today than we did then. We know too the good effects of sanitary laws and we adhere to them as well as to the restrictions, backed up by law, and hence we reap the good results of years of experience (that which has cost the world many human lives). We stand living monuments today ready and willing to render assistance and do you all manner of good, and today we come in a body as advisers to you and hope our work has not been in vain. To some of our own citizens this convention has been a strange affair, to think that physicians would convene for the purpose of telling you how to prevent disease. How to stamp it out, for indeed it can be done, and many time has been done. Some think this contrary to our business. But the mighty dollar has no place here. This is for your benefit and ours. We want the people educated to the fact that there is more logical truth in actual scientific research than in all phantomed mind-cures in existence. We want science to flourish as it should. I say then to this convention that the local health officer is indispensable, and the day has come when all cultured minds say he is indispensable. In many times you could well dispense with your marshal, yes, even with your police force in time of malignant epidemic, for so long as quiet reigns upon our streets our police are of nominal service, so also is our health officer, but let the cry of fire or fight sound through the air, then begin the policeman's duties, but let the presence of small-pox be heard of in a city ward, could you get a policeman near it? I guess not. But the poor doctor must go, and the health officer; so you can see of how much vital importance he is.

Take diphtheria or scarlet fever in malignant form where their ravages are so plainly marked upon families where one, two, three or more children have been taken to a lonly grave in the broad open field, lowered in the rough box, take the yellow fever of the south or the Asiatic cholera of the east. They are very undesirable combatants to physicians, though today plenty of

good men in the medical profession are ready to fight with them. Now as to the duties of the local health officer in an outbreak of contagious disease dangerous to public health. We have many diseases to contend with and we are glad that they are not all contagious. The State Board of Health has pointed out such as are dangerous to the public, such as scarlet fever, diphtheria, small-pox, etc. When the presence of any such contagion is made known to the health officer it is his duty to go at once and investigate, and if the reported conditions prove true, then begins his work. He should isolate his patients in clean, elevated, warm, well-ventilated quarters, with all carpets, superfluous clothing, window curtains, etc., removed, also wall hangings. Then disinfectants should be freely used, such as sulphur fumes, chloride of lime, and anything that will distroy the germs of the contagion. We are not going to argue what will, and what will not, destroy all contagious microbes because too varied are the opinions of our best scientists, but we do know that some things will destroy the germs of certain diseases and we have these germicides at our disposal. The local health officer whose duty it is to supply such information on application ought to be appreciated by our people. Did you ever think for a moment the great danger we physicians take upon us, and the health officer whose duty it is to go, and who expects to return and look after patients. Think of his danger to contract the fatal malady, and again how very careful he should be not to convey it to others. Fortunate for us as physicians we seldom carry contagion.

I know full well that infectious diseases are more frequently carried than are contagious diseases by physicians. So then we say that one cannot be too careful in his cleanliness in the sick room. Physicians sometimes contract disease fatal to themselves in the care of their fellow-men. But what is that, some may say. You may talk if you like, of going to the battle-field where shot and shell fly thick and fast, this too is all brave. Yes it is, but you call the doctor and he is expected to go, life at his own risk, to face the dreaded disease, where perhaps he receives his death wound, though it may not be the leaden bullet nor the sword's point, but the bayonet of death. This too is brave. This too is expected of us. Then can you wonder longer why we come to you in such a convention as this, to advise with you how best to battle with contagious diseases, so that we may not suffer loss more than you. Many a brave heart has fallen in the honored, arduous duties as physician at the bedside where he is wanted to alleviate disease and palliate pain. It would in this convention do no harm to impress upon your minds the futher necessity of sustaining an active health officer, because I can refer you to an outbreak of small-pox during the month of March last wherein life was sacrificed because no one knew how to manage it in the condition they were in. No one knew who the health officer was or who would be the best adviser, though very unfortunately it was first supposed to be malignant chicken-pox, nor did they know better until two or three had died, then they began to investigate and to their horror it was pronounced malignant small-pox, some 16 or 17 persons dying of the fatal malady; and to show how easily disease is spread, this same outbreak of which I speak happened in this way: A young man from Buffalo, N. Y., came to visit his aunt. He was there some two weeks when two of the household were taken sick, the physician called it chicken pox. In the meantime the landlady had arranged for a dance, friends were all invited, they came, and on went the dance; there being no restriction placed on the then suposed chicken-pox, all

were thoroughly exposed. Now when it was made known that it was small-pox there was not vaccine virus enough at that time to vaccinate all who applied to the various physicians, nor could there be had physicians enough to attend those that were stricken, so the provincial board of health were obliged to send physicians to help them. The small-pox frightened their local board, they did not know what to do under the circumstances, but as soon as the health officers began their restrictions there was no further spread of the disease than to those who had been exposed and their families. The board of health stopped all travel on highways leading in any way to the stricken locality. Now those restrictions are complied with even if the law has to be enforced many times. Had there been no restriction, no disinfecting of mail matter, where would this epidemic have stopped. Therefore we claim, yes we assert beyond a doubt, that contagious diseases can be so restricted on sanitary principles, that many times not even one death may occur from an outbreak. The health officer should be consulted in epidemics, and I say further that so far as small-pox is concerned, there is no reasonable excuse for the man, woman or child, who does not bear the mark of a successful vaccination, whether it be of recent production or not, because the board of health will supply free vaccination through the agency of the local health officer.

And now a word as to the compensation. It would do you all good to know that the health officer of Otsego (although he is recompensed for all his services in kicks and cuffs and backbitings) is ever anxious to do his work well; but I hope the day will come when the local health officer (whoever he may be) will be so recompensed for his duties, in dollars, and cents, that he will give more earnest heed to the condition of things, because then he could afford to, and I hope that if you people are ever asked to vote on such a subject you may heartily respond.

THE DUTIES AND THE COMPENSATION OF THE LOCAL HEALTH OFFICER.

BY HENRY B. BAKER, M. D., SECRETARY STATE BOARD OF HEALTH, LANSING, MICH.

The Annual Death-rate in Otsego.—How many Lives should be Saved from Communicable Diseases.

The population of this place is, I suppose, about fifteen hundred, or possibly two thousand. The average death-rate for such a place would lead us to believe that there are here, in each year, about thirty deaths from all causes. Mentioning, now, only the most important communicable diseases, these thirty deaths would include about three or four from consumption, about two from diphtheria, about one from scarlet fever, and one from typhoid fever. In some years the correct figures would be less, and in other years greater, but in a long series of years the figures I have given would probably be found to be nearly correct, under the ordinary conditions which have prevailed throughout this country.

Reliable statistics, collected by the Michigan State Board of Health, have

proved that (even after the disease is introduced) about eighty per cent of the deaths from diphtheria and from scarlet fever are prevented by thorough isolation of all infected persons, and the thorough disinfection of infected persons, things, and places, therefore the thorough enforcement of these measures will save, in each year, in this village, or at least in the average village the size of this one, more than one person from death by diphtheria, about one person from death by scarlet fever, and I think also about one person from death by typhoid fever. Surely the saving of these several lives is well worthy the effort of your people! It cannot with certainty be done except by general coöperation among you. It cannot be done except by organized coöperation. In other words, you cannot do it without an efficient health officer; and then you must aid him to the extent required by the laws of the State. If, however, you have and maintain an efficient health officer, and otherwise comply with the laws, and act in accordance with the recommendations of the State Board of Health as set forth in the pamphlets of instruction issued by the Board, you can certainly save these lives. Will you do it?

If you really desire to do it, the plans of procedure are all worked out, and most of them are embodied in State laws. The measures applicable to each of these diseases are carefully explained in the several pamphlets which the State Board of Health has issued, and which are distributed in this audience. Some of you are already familiar with these methods, and I hope that all of you will soon become familiar with them, and that there will be such a thorough support of your health officer, and such a strong public opinion as will hold him steadfastly to his duties, and such as will pay him so well for his services that he can afford to do his best for the prevention of disease, leaving to other physicians to care for those already sick. To do this requires money—money by the hundreds and perhaps by the thousands of dollars, every year. This brings us to the question:

HOW MUCH MONEY CAN THE AVERAGE VILLAGE AFFORD TO PAY FOR LIFE-SAVING PURPOSES?

Of course I believe that lives can be saved from other diseases than those communicable diseases which I have just mentioned; but I have mentioned diphtheria and scarlet fever because in those diseases we have the absolute proof that lives can be saved by measures that are well-known to us, and which can be summarized in three words—"isolation and disinfection."

When lives of young persons are lost to a community something else is lost, namely, their prospective earnings,—the wealth which otherwise they would have created. There are several ways of estimating this loss. A few years ago a good negro slave was valued, for what he would earn in excess of his keeping, at about eight hundred dollars; statisticians usually value a person in the prime of life as worth to the community about one thousand dollars. Children are worth as much less as it will cost to raise them to the most productive age. But if we allow that the two, which in the average place the size of this should be saved each year from diphtheria and scarlet fever, are worth only half the price of a grown person, there is a saving of a thousand dollars a year from these two diseases alone. If one life is saved each year from typhoid fever, by disinfection of infected matters wherever there is a case (and I believe this can be and should be done) the person

saved will ordinarily be in the prime of life, and this saving should be counted as eight hundred or a thousand dollars. There is, then, "in sight," as it were, a saving of two thousand dollars a year in the village by such work as can be done, with reference to three of the dangerous communicable diseases, by and in connection with an efficient health officer. Or, to put the subject in another light, if this village were to expend two thousand dollars a year in the exact way in which I have indicated (and which I may state more clearly further on) it would not lose money thereby,—it would only be paying, to the health officer and a few others, as much as without such payments is actually lost to the people of the place. Is it not better to pay money for public health services than to bury that of as much money value in the graveyard?

We will admit, if you please, that when deaths occur, the loss is not equally distributed among the people of the village; generally the loss falls most heavily upon the bereaved family; and this is especially true if the death is of the bread-winner of the family. But it should not require much argument to show that the prosperity of a village depends greatly upon its healthfulness and the safety of life therein, and that, in a long series of years, the deaths are distributed somewhat equally among the people, and that, even if they were not equally distributed, a high moral sentiment should prompt us to guard the common safety of life among us. It was recognized even before the Declaration of Independence, July 4, 1776, that to each citizen the right to exist,—the life of the individual is among the unalienable rights to secure which "governments are instituted among men." It is plain, therefore, that one of the highest, perhaps the very highest function of a government is to guard the lives of the people.

Having reference, then, to only three of the most important communicable diseases, it seems plain to me that a village of the size of this, has the undoubted right and can well afford to expend, in every year, two thousand dollars, for the restriction and prevention of diphtheria, scarlet fever and typhoid fever. And I think there is good reason to believe that you, or the citizens of the average place of the size of this, would make money by so doing; because you would incidentally save lives and cases of sickness from other diseases than those I have mentioned; and, besides, in my account of losses by those three diseases, I accounted only for the losses by reason of the deaths, leaving out of the account all the great expenses for the sickness.

HOW MUCH SICKNESS IS THERE, ORDINARILY, FROM THESE DISEASES?

The reports compiled by the Michigan State Board of Health show that for each death from scarlet fever there are over ten cases of sickness from that disease; that for each death from diphtheria there are four cases of sickness from diphtheria.* Therefore, the two deaths on an average yearly from diphtheria in the average place the size of this, should represent eight cases of sickness, and the one death from scarlet fever represents ten cases of scarlet fever. Each one of these eighteen cases of sickness involves a considerable expense; and, inasmuch as eighty per cent of them should be prevented by an efficient health service, fourteen of the cases should not occur—an efficient health service, properly supported, should in each year,

*The discrepancy between the proportionate sickness from these diseases may be because the mild cases of diphtheria are not recognized and reported as they are in scarlet fever.

save all the expenses incident to fourteen cases of dangerous sickness. All such savings would be clear profit, in case the village expended the two thousand dollars per year, as previously suggested, and saved two thousand dollars worth of lives, as I have shown may reasonably be expected.

HOW MUCH SHOULD BE PAID FOR HEALTH SERVICE IN ADDITION TO WHAT IS NOW PAID?

By the preceding computations I have tried to learn and point out to you how much a place, the size of this, can afford to pay for its health service; and, for that purpose, I have assumed that the village has been in the habit of neglecting one or the other of the two important measures for the restriction of dangerous communicable diseases—that it has neglected either the complete isolation of every infected person, or the thorough disinfection of all infected substances, in which case the statistics have proved that there are, in such places, on the average, five times as many cases and five times as many deaths from scarlet fever and from diphtheria as there are in those localities in which all this is thoroughly accomplished. If, however, such neglect has only been occasional—if the village has paid for and has secured the average amount of public-health work, the saving by complete isolation and disinfection in the two diseases mentioned might not amount to eighty per cent of the cases and deaths in addition to what you have already accomplished. But, if this is an average place, it would certainly amount to fifty per cent;* and what we most want to know is, how much the village can afford to pay in all. If, however, you have already secured average work in this direction, and want to know how much more should be accomplished, we have facts which may enable us to estimate this. Without troubling you with long details, I will say, that if you reduce the amount already computed by the difference between eighty per cent and fifty per cent, in other words, by thirty per cent, you will find what the village may properly expend, and also what it might well have been expending, to have secured its average condition. Thirty per cent of two thousand dollars is six hundred dollars, which you should now be expending if you have secured results which are equal to the average about the State, and fourteen hundred dollars per year additional is what you may well aspire to expend, in order to do what you should do in the way of restricting the three diseases I have named. If you pay part of this to a health officer who is thoroughly efficient, and expend the remainder for other measures in the direction of public-health service, I believe you will save the entire amount of money from being lost to your people by the saddest of all occurrences—the deaths, by preventable diseases, of loved ones who should have added wealth and prosperity to your village.

WHAT IS THE EXACT NATURE OF THE WORK TO BE DONE?

I would not have the health officer, or the local board of health, neglect any duty which is now required by law or custom. Nuisances should be

* Refer to the figures shown in diagrams and tables distributed in the audience, which prove this. It will be seen that in those outbreaks where isolation and disinfection were both enforced there were only about half as many cases of sickness and deaths as in the average of all outbreaks. And as we have seen that in a place the size of Otsego there are, on an average, cases of all these diseases each year.

abated, even if there is no absolute certainty as to just how they may cause sickness. House to house inspections by the health officer may well be maintained at regular intervals. Such inspections yield knowledge useful by the health officer in some of his duties, as, for instance, those for the prevention of typhoid fever. But none of these things, which it has so long been considered the sole duty of the health officer to attend to, have much to do with the restriction or prevention of scarlet fever, and probably not with diphtheria. For that work entirely different methods must be employed. To do this work, the health officer, and the people who coöperate with him, must have a good theoretical and practical knowledge of the "germ theory of disease." They must know that the "germs," the contagia of some of the dangerous diseases, cannot, so far as we know, be reproduced outside the body of man or of some animal. A few years ago it was generally believed that all we had to do to protect ourselves from all the dangerous diseases was to clean up and to keep clean; it was thought that these diseases were all reproduced in filth. Now we know that this is not true; that, while typhoid fever probably is reproduced in filth, outside the body, or, if its specific cause is not reproduced, certainly it is stored in filth outside the body, and all ordinary measures of cleanliness are important for the prevention of that disease, it is not true that all diseases are thus caused, or that anything worthy of mention can be done for the prevention of some of the most dangerous of them by attention to ordiuary cleanliness. To show you how strong the evidence on this subject is, I may mention that for several years there has been offered a prize of a thousand dollars to any person who will demonstrate the possibility of reproducing, outside the animal body, the vaccine virus, or a modified virus of small-pox, capable of preventing small-pox in the way well-known to be accomplished by vaccine virus propagated in man or animals. No one has claimed the prize. It seems to be impossible to find or to create any conditions outside the living body which will enable this contagium to reproduce. There is no reliable evidence that the contagium of scarlet fever can be reproduced outside the body. There is question whether the contagium of diphtheria can be reproduced outside the body, and still more question whether in ordinary life it is so reproduced. One of the things which makes it improbable that it is so reproduced is the fact, proved by the statistics supplied by hundreds of health officers in Michigan, that simply by the isolation of infected persons and things, and their thorough disinfection, three-fourths or four-fifths of the cases and deaths from diphtheria which otherwise would occur are prevented. If the disease were generated in or by ordinary filth, it does not seem probable that isolation and disinfection would be so very effectual for its restriction and prevention. But it has been abundantly proved, that any person or animal infected with the disease is extremely dangerous to all persons who are susceptible to the disease; that the contagium from the person or animal, even if it cannot grow or multiply outside the body, yet can lie for months and years dormant but virulent to produce the disease whenever it is breathed in by a susceptible person; that this contagium clings to clothing, books, letters, papers, walls of rooms, curtains, and articles of furniture, and may thus reproduce the disease long after the recovery of the person in whose body the contagium was formed; that, therefore, time alone cannot be relied upon to protect us from the contagium; that no ordinary cleanliness can

protect us from it; that nothing is available for this purpose short of some gaseous disinfectant which will follow the contagium to the uttermost recesses of all cracks and crannies, and will then and there attack and destroy its life. The mode of disinfection which, in this State, has been proved effective for the prevention of scarlet fever and diphtheria, is the exposure of all infected things to the fumes of burning sulphur; and the State Board of Health recommends that the fumes be as strong as will be made by the burning of three pounds of sulphur in a room ten feet square, or in each thousand cubic feet of air-space. Discharges from the throat and mouth are to be taken on rags, and immediately burned, But for complete directions I must refer you to the pamphlets published by the State Board of Health.

It is important that you maintain a local health service so that, at a moment's notice, all the measures for the complete isolation of a person sick with one of these dangerous communicable diseases shall immediately be put in operation; that, at any time, the appropriate disinfectants, for use in the sick room, and after the recovery or death of a patient, shall be ready, and shall be faithfully and intelligently employed. It is important that you have, at all times, an efficient local health service so that, in case of need, you can have the benefit of the aid which can be rendered by the State Board of Health. A good health officer is powerless to protect you unless supported by the people. In order that the people shall support him in strong measures for the restriction of infected persons and things, they must know wherein lies the danger, must appreciate the importance of restrictive measures, they must know how isolation and disinfection are accomplished, and how they may be made imperfect, and deaths result. This coöperation of the people, which is so important, can be had if they can be led to see the truth, and they can be led to see the truth, if it is presented to them in the right way at the right time. In an outbreak of scarlet fever or diphtheria, if prompt notice is given to the local health officer, and by him to the State Board of Health, the local officer can promptly be supplied with pamphlets which tell, in brief language, just how to restrict that particular disease; and if the health officer distributes these pamphlets to the *neighbors* of the family in which the disease is, they will then be likely to read and to pay attention to the best methods of preventing the spread of the disease into their own families. They will be more ready to aid the health officer than they would be if left in ignorance of those best methods of restriction.

This may serve as a hint as to some of the ways in which an efficient local health service, coöperating with the State Board of Health, and securing the coöperation of the neighbors of those sick with communicable disease, may act for the protection of life and health in the locality.

The State Board of Health publishes, each year, a pamphlet of instructions to those local health officers who are for the first time elected for that service. The contents of that pamphlet also serve as reminders to those health officers already familiar with the duties of the office, also to call attention to any new laws which may have been passed by the legislature, or any new and useful fact which may have been learned from a compilation of the reports collected by the State Board of Health. Thus every locality that maintains an efficient health service which is actively in harmony with the State Board of Health, has the benefit of the combined experience of all

the other similar boards of health throughout the State, and, in fact, of all the experience of similar organizations throughout the world; because the State Board of Health is constantly exchanging the reports of its work for the accounts of the work of other health officers and boards throughout the world. There is an old saying that "Dwarfs see far on giants' shoulders." This may serve to fix in our minds the fact that a very humble and ordinary person, acting as a local health officer in an ordinary village, may accomplish great results by life-saving measures, when he is lifted up and borne forward on the shoulders of all of mankind who are engaged in similar work, as he may be so aided if he puts himself in the way of such aid. In this work, the "giants" are always in existence; in many places throughout the world excellent public-health work is constantly being done; but it sometimes happens that a locality fails to provide even a "dwarf" to act as a local health officer.

I should be glad if each and every village in Michigan would constantly employ the best physician within its limits as a sanitary advisor and health officer, one who would put himself on the shoulders of all the "giants" in sanitary science and public-health work, in Michigan and throughout the world, one who would be constantly employed for the prevention, and, when required, for the restriction of disease, and one who would thus save to the people of the village not only as much in money value as is expended for public-health work, but also a vast amount of pain, of sickness, and agony, and the lives of children and other loved ones who without such public-health work are constantly being torn from their parents, relatives and friends.

HENRY B. BAKER.

DISCUSSION.

Dr. Arthur Hazlewood, of Grand Rapids, member of the State Board of Health:—There are one or two points which the speakers omitted to mention. Your health officer is powerless unless the Board assists. But you must do some of the work yourself, and give him all the help you can. One point has been omitted,—that is the pecuniary expense of one case of sickness. Every scarlet fever case costs from twenty to fifty dollars. For the saving of these cases the health officer should receive a good salary.

Dr. Baker stated, in answer to a question, that, except in the mining districts in Michigan, where the proprietors of the mines sometimes employ a physician by the year to treat all the employés about the mine, he believed there was no place in Michigan where physicians other than health officers were salaried for protecting the health of the people; but in Illinois there was a city where an organization maintained three physicians on salary.

The subject was further discussed by Hon. James M. Ballou, B. A. Nevins and others.

Drs. Baker and Hazlewood hoped that this convention would lead to the formation of a local sanitary organization, and, on motion, the following were appointed a committee to bring about such an organization: Prof. G. A. Osinga, Hon. W. C. Edsell, and Dr. L. E. Clark.

Dr. Baker stated that, if any help was needed, the library of the State Board of Health at Lansing, was accessible to them. The office of the State Board would also extend any other aid in its power.

On motion a vote of thanks was extended to the State Board of Health for the holding of the convention, and to those who have contributed for the papers and discussions which had been presented.

Hon. James M. Ballou, President of the convention, then made a few remarks as to the value and importance of such conventions, and declared the convention closed.

AMERICAN
STATISTICAL ASSOCIATION.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

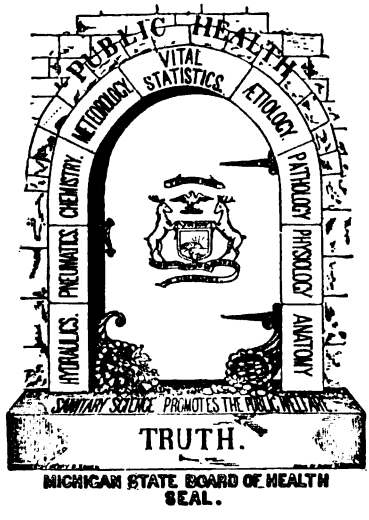
TECUMSEH, MICHIGAN,

JUNE 6 AND 7, 1889,

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF TECUMSEH.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1889.]

No. 302.



MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
DARIUS D. THORP, STATE PRINTER AND BINDER.
1889.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

TECUMSEH, JUNE 6 AND 7, 1889.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1889.

Darius D. Thorp, State Printer and Binder, Lansing.
[No. 302.]

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinion expressed therein.

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT TECUMSEH, MICH.,

JUNE 6 AND 7, 1889.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1889.

This Convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Tecumseh, acting with a committee of the State Board of Health.

The following named persons constituted the local committees:—

Executive Committee.—Dr. George Howell, Dr. L. G. North, A. W. Mills, D. T. Hall, Dr. Samuel Catlin, James Elliott, E. Aimes, C. F. Field, George Heesen, Dr. J. F. Jenkins, Dr. C. M. Woodward.

Reception Committee.—Local Physicians, Dr. S. Catlin, Chairman.

Finance Committee.—Mr. A. W. Mills, Mr. George Heesen.

Committee on Music.—Dr. C. M. Woodward, Chairman.

The committee from the State Board of Health consisted of Henry B. Baker, M. D., Lansing.

The officers of the convention were: President, Hon. George Howell, M. D.; Vice-Presidents: Dr. Samuel Catlin, Tecumseh; D. T. Hall, Tecumseh; Dr. J. L. Tuttle, Clinton; Dr. R. H. Nelson, Ridgeway; Dr. D. W. Loree, Ridgeway; Dr. Daniel Todd, Adrian; Dr. L. M. Jones, Brooklyn; Dr. Frank Turbut, Palmyra; Dr. Walter S. Morden, Macon; Dr. Julius A. Vaughan, Springville; Dr. N. D. Yale, Deerfield; Dr. John D. Tripp, Tipton; Dr. C. E. Begel, Holloway; Dr. W. E. Scriber, Blissfield; Dr. Fred. R. Seger, Adrian; Secretary, Dr. L. G. North, Tecumseh; Treasurer, A. W. Mills, Tecumseh.

Among those in attendance at the Convention, not residents of Tecumseh, were the following persons: Governor and Mrs. Luce, Lansing; H. Lowrie, Detroit; Daniel Todd, M. D., V. A. Baker, M. D., Fred, R. Seger, M. D., Mrs. Greene, M. D., J. R. Gilke and Mr. Westgate, Adrian, Mich.; J. L. Tuttle, M. D., and J. W. White, M. D., Clinton, Mich.; D. W. Loree, M. D., and R. H. Nelson, M. D., Ridgeway; Dr. J. B. Haynes, Dundee; A. C. Taylor, M. D., Manchester; D. P. McLaughlin, York, Mich.; E. N. Palmer, M. D., and L. M. Jones, M. D., Brooklyn, Mich.; Julius Vaughan, M. D., Springville, Mich.; C. E. Begle, M. D., Holloway, Mich.; Dr. Perkins, Tip-

ton, Mich.; Dr. Jones, Springville, Mich.; Prof. V. C. Vaughan, M. D., Ph. D., member of the State Board of Health, and Prof. Frederick G. Novy, Ann Arbor, Mich.; Prof. Henry F. Lyster, M. D., Member of the State Board of Health, Detroit, Mich.: Prof. Delos Fall, member of the State Board of Health, Albion, Mich.; Henry B. Baker, M. D., Secretary of the State Board of Health, Lansing, Mich., and A. Arnold Clark, Lansing, Mich.

First Session—Thursday, June 6, 2:30, P. M.

The first session of the Convention was called to order by the President, Hon. Geo. Howell, M. D., of Tecumseh. After prayer by Rev. J. S. Joslyn, and a vocal Solo— "Could I but Say"—by Miss Dora Grayson, Geo. Heesen, President of the Village, gave the following address of welcome:

ADDRESS OF WELCOME.

BY GEO. HEESEN, PRESIDENT OF THE VILLAGE.

Ladies and Gentlemen of the Sanitary Convention—In behalf of the citizens of Tecumseh, I welcome you.

I am glad to see so many citizens and visitors, and to those who are to take part in this Convention I would say that we shall be glad to listen to the different topics which will be discussed.

We believe that these discussions will awaken a great interest in this community, that they will be of great benefit to the citizens of the village and adjoining towns, and that we will learn from them how to perfect the sanitary surroundings of our homes and localities.

Again we welcome you to our midst.

Henry F. Lyster, M. D., Member of the State Board of Health, Detroit, in responding to the address of welcome, spoke of the necessity of popular education in regard to sanitary reforms and of the object of such Sanitary Conventions.

THE DUTY OF PREVENTING DISEASE.

BY LEMON BARNES, M. D., OF TECUMSEH.

It is about the easiest thing in the world to accept an invitation. It requires little thought and less volition, but the decision once made, the case is beyond recall.

It was a rash promise on my part to consent to deliver an address before such a presence as this, and that too in twenty minutes. I shall commence without an exordium and close without a peroration.

It is an old adage "An ounce of prevention is better than a pound of cure." It is much better every way being a great saving both in money and health. In fact the most expensive luxury in which the non-medical world indulges is the medicament for disease, for which there would be less necessity if the

less expensive prophylactics were used,—sufficient refreshing sleep, wholesome food and drink, plenty of out-door exercise, pure air, suitable clothing and a healthful home with modern sanitary environments. Add to these a knowledge and practice of the laws of health and what a doctor's bill would be saved!

It may be confidently asserted that efficient sanitary administrations reduce mortality one-half.

Consider then the many hundreds of thousands of deaths, the many millions of cases of sickness with their multiplied millions of days and nights of protracted suffering and distress and the immense financial loss in the United States from preventable causes and what an argument for sanitary reform! Consider again how imperative must be the duty so clearly indicated by the appaling fact that one-half of these deaths are unnecessary.

I know there are many obstacles in the way of this much needed reform. The average man thinks more of making money than he does of preserving his health not knowing that by pursuing such a course he is liable to loose both. The average society woman will sacrifice her health to fashion and bring up her daughters to make the same sacrificial offering. How much avarice and fashion have done to shorten human life and make man the mere wreck of his noble self may never be known, but it does suggest the thought, health is more valuable than riches and more to be admired than fashion.

There may have been a time when the sin of ignorance was winked at, but the time has now come when ignorance on this subject is a reproach to any people—for it stands in the way of reform even more than avarice and fashion—and its removal affords an opportunity for educational work so real as to leave no excuse for the benevolent and philanthropic to waste their energies or means on imaginary evils.

The State Board of Health is doing much in the educational work of sanitary reform by publishing the extensive observations and careful investigations of specialists and by holding conventions. These conventions are of great advantage to any community where held, for they are not only conducted by representative members of that Board but they utilize local talent. As "iron sharpeneth iron so a man sharpeneth the countenance of his friend." They challenge investigation and provoke discussion. But we should not shift upon boards of health and conventions the responsibility of this work—we have too much personal interest in it for that. To know how to preserve health is of more importance even than the more erudite knowledge of the healing art. A few preventives timely employed, like a few remedies in skillful hands, are far better than many ignorantly used.

Many neglect the observance of the laws of health, neglecting what they know, because they do not know more, but if we practice what we do know we shall know more by experience.

Study, observation, experience and practice, are all in the line of progress and lead to the highest practical results.

Then too, the observance of the laws of health influence the mind as well as the body. "Mens sana in corpore sano" (a sound mind in a sound body) is an old maxim. A healthy body is necessary to a vigorous mind. There is a robustness of mind never attained by one whose whole life is a battle with disease.

Morality also suffers amid the conditions of disease. Squalid, filthy

neighborhoods and the slums of the city are not only sickly but immoral. "Cleanliness is next to godliness." The dangers of filth and the blessings of cleanliness are the blessed evangels, not only of better health but of better morals. The health officer, therefore, is a preacher of righteousness.

In still further presenting the duty of preventing disease, I will drop the synthetical and take up the analytical method.

TYPHOID FEVER.

The germ of typhoid fever must be taken into the alimentary canal "causing the peculiar irritation of the intestines to produce this fever." It is true it may be communicated through the air, but in this case it is swallowed, for simply inhaling it into the lungs will not produce the disease. The germ enters through the alimentary canal and then passes off in the dejecta. If that were the last of it then it would not be so bad, but its vitality is most remarkable.

Prudden succeeded in resuscitating these germs after they had been heated to 133° Fah. and in this same investigation resuscitated them from ice in which they had been frozen for 103 days. This fact prepares the way for the statement of Dr. Lee, Secretary of the State Board of Health, of Pennsylvania, in regard to the terrible scourge of typhoid fever which visited Plymouth, Pa., only a few years ago. He says: "David Jones, sick with typhoid fever, lay on his back for many weeks in his cottage, on the bank of a little stream which supplies the reservoir of the village of Plymouth at the foot of the mountain. It was found out in investigating that that cottage was so near the stream supplying the reservoir at Plymouth, that, as soon as the weather permitted a sufficient thaw to allow the frozen accumulations of weeks of dejecta from this one case to reach this stream, a local epidemic of such magnitude ensued during the following April and May, of 1885, and continued until the following September, that it is scarcely paralleled in modern history, and at the same time making this one of the most instructive, as well as one of the most terrible instances which ignorance has contributed to the record of disease."

Right here is where the fearful responsibility comes in: this outbreak might have been prevented. What can not be prevented must be endured, but what can be prevented ought not to be endured. Humanity demands that the well known causes of disease be stamped out and that the unknown causes be searched out.

More than ordinary care should be exercised to prevent the spread of malignant diseases and any carelessness in regard to them should be treated as criminal. This Plymouth epidemic is only one out of many that might be mentioned as resulting from inexcusable ignorance and culpable carelessness.

Scarcely a year passes even in our own State, highly favored by nature with flowing streams and crystal lakes, with a fertile soil and healthy climate,—but we hear of some terrible epidemic proving fatal to hundreds.

Only a few years ago there occurred in the little village of Oxford a typhoid fever epidemic causing the death of many of its citizens and spreading gloom throughout the entire community. On investigation it was found that the merchants had been in the habit of dumping half-barrels of spoiled fish and other decayed substances in their back yards, which, by the rains, were drenched through a porous soil into the drinking water of the people.

Professor Vaughan, in speaking of the Iron Mountain epidemic, says: "The result leaves no room for doubt concerning the existence of the specific poison of typhoid fever in Iron Mountain water."

This disease has proved so fatal that there are on an average 1,000 deaths from it annually in Michigan.

In many of these terrible epidemics the drinking water was found to be the medium of carrying the contagion. It is not therefore so much the air we breathe as the water we drink in which the danger lies in regard to typhoid fever.

When we consider the 10,000 cases of sickness and 1,000 deaths from this fever in our State and the facts in regard to drinking water, the water-supply of the people can not be too carefully looked after.

DIPHTHERIA.

In regard to diphtheria, it is well known that it does not arise *de novo* but "by the reception into the system of an existing specific poison."

This disease, unlike typhoid fever, is more commonly communicated through the air. The area, however, of its contagiousness is small, but within that area its virus is persistent and highly infectious, and in this it resembles scarlet fever. It arises from damp places, is propagated in ditch-water, and blown as an infection through the air, causing a genuine epidemic.

Damp, foul sewers, cellars, and ill-ventilated places under floors afford conditions favorable for the development and propagation of the diphtheritic virus. It is vastly easier to keep the poison out of these places than it is to get it out after it once gets in. In fact, judging from the past failures, it is practically impossible to get it out of the sewage of the large cities.

It may be limited by sanitary measures, the diphtheritic patients may be isolated and disinfected and in this way the best practical results reached. It is more important to know how to prevent diphtheria than hydrophobia, for its death record is greater.

If the germ theory of disease be true, (and who doubts it?) then the effectual way to prevent disease is to search out and stamp out the poisonous germs. But if this be impracticable then may we not by cleanliness, pure air, wholesome food and drink, destroy the poison qualities on which these foul germs live and thrive.

If all contagious diseases are preventable, then how appalling the fact, that there are so many millions of deaths from these diseases with all their attendant sickness and suffering. It would seem that there is great need of a higher sense of responsibility to be felt in this matter. The inventor of the life preserver, just before the completion of his invention, said, "I can not rest, I see millions drowning and I am the one to save them."

Certainly the responsibility of preventing disease is far greater.

It is important to search for practical means to prevent the spread of disease as well as to battle with it on ground already preoccupied. If the sanitary millennium cannot be realized, this is no reason why the work of investigation should not go on, the next taking it up where the last left off.

DISCUSSION BY V. A. BAKER, M. D., ADRIAN, MICH.

It is a self evident truth that men aim to make themselves happy. That they are mistaken, too often, needs no delay of argument. It is not that the substance casts only a shadow, or that art and

science are not playing a lively part in behalf of the race, but that we take little heed of the morrow so long as we feel no harm from the sin of today.

State to an individual that air is the first and last great want and, although he will concede it, yet take a survey of his sleeping apartment and you will more likely than not find no heed taken as to ventilation, or what may be in the cellar beneath or the soil around his dwelling. Publish in the newspapers and magazines convincing statements regarding the danger of drinking water from wells in near proximity to soil polluted with filth, or from any supply that may be doubtful, and the teaching is unheeded as a rule, until some fatal form of fever awakens them from their lethargy and people may then heed the simplest of facts and boil all the drinking water, or better yet, if possible, seek a more wholesome supply. That violation of physical law costs immensely of suffering and life is well known. We need to study more the law of cause and effect and put our dwellings in order and keep guard over them, and learn to eschew improper food and careless habits of life generally.

We need, also, to institute vigorous reform in the management of our children—the men and women of the near future. We build fine educational temples, we call meetings and devise means whereby we may best serve our children by making efficient our public schools, yet we call no meetings to devise the best methods of home culture, seeming to expect of the schools the impossible. Laxness of home discipline cannot be overcome in the school room. If we will eat and drink and smoke and chew and dissipate as though we owed our constitutions a grudge and must cultivate grossness, fearing too great a degree of refinement, we are poor sponsors to chide our children for smoking, chewing, swearing and sometimes dram drinking.

There are many points for us to contemplate that go hand in hand with a well regulated dwelling if we have healthy inmates. The whole may be compassed in the one word—discipline,—discipline regarding the quantity and quality of the food we consume, the regularity in taking the same, the avoidance of mincing, or teasing the digestive organs unseasonably, regular hours for sleep, and in an atmosphere as pure as may be, remembering that our sleeping apartments, as well as our day apartments, must communicate with outside air, and must be so contrived as to discharge constantly the air we render impure by emanations from our bodies. The air we exhale contains 40 parts in 1,000 of carbonic acid, and if it contains 100 parts per 1,000 parts of air it is fatal to animal life, and we often have headache, heart palpitation, while infants and young children have convulsions by breathing air made impure by our sleeping apartments being poorly ventilated.

To be on the better side in that which pertains to the well-being of the household we need remember that the day has dawned when we may think for ourselves, for until within a recent time a few did all the thinking in matters of learning; but the printing press, the daily papers, the journals and magazines all teem with intelligence, even in matters pertaining to our own good hygienically and our efficient State Board of Health publishes literature upon this subject available to all in an endeavor to do away with old time ignorance regarding the simplest laws governing our daily lives, in the selection of our food, our drink, the air we breathe, the sunlight that should enter our dwellings, the putting of soil and all surroundings in the best condition to promote health and longevity. And yet in the face of all this there are quite too many who will not think for themselves, who keep themselves and rear their children in superheated, air excluded apartments, encourage precocity in their children, pushing them forward with more ambition than judgment, dressing them with extremities scantily protected, and when one dies of croup or other ailment contracted by extremes incident to such management, and the death is counted providential, it is too plain that it cloaks ignorance, appeals to superstition and blocks the wheels of intellectual progress.

We may summarize in a few words that if we have sound minds in sound bodies, all our surroundings must embrace, as near normal as may be, air, water, sunlight, nutritious, well cooked food, comfortable clothing, regular hours for sleep and rest, avoidance of worry and overwork, of tobacco, strong coffee or tea, and that curse of mankind—alcoholic beverages. We must also avoid drugging, nor be duped by specious promises of patent medicine vendors. We should also avoid using cathartics in a general way, as their action is irritating and their frequent use exhaustive and full of mischief. If we will follow these simple rules ourselves and educate our children to this standard, we will have very little need of hospitals, prisons, insane asylums, homes for inebriates, and the race will be stronger, purer and better.

DISCUSSION BY GEO. S. TIFFANY.

We have just listened to an interesting article and discussion on "The duty of preventing disease." I would amend the subject by substituting the word "pleasure" for "duty." I believe that

the motive that has brought us together is a more pleasurable one than a sense of obligation. A poor, uneducated factory hand in Scotland, was accustomed to wander along the banks of the river watching the bathers, the boatmen and little children at play,—looking for an opportunity to save from drowning. He had saved more from death in that manner than any other man in all Scotland. Some one asked him why he thus sought to save life. He replied: "Ah! mon, the *pleasure o' it*. The *pleasure o' it*." The greatest compensation the physician or surgeon can receive—if he have the sympathies common to men—is to see the rigid lines of suffering give way to an expression of painless tranquility, and the patient, from whom a "body of death" has been removed stepping forth into all the activities of healthful life.

The paper was also discussed by E. N. Palmer, M. D., of Brooklyn.

THE SEWERAGE AND DRAINAGE OF TECUMSEH.

BY GEO. S. TIFFANY, OF TECUMSEH.

A discussion of the subject of sewerage involves the question of water-supply, for an abundant water-supply is essential to a system of sewerage. I shall assume that the water-supply of Tecumseh will be, as in the past, in the great gravel bed beneath us. I know of no other place from which a good water-supply may be obtained. There are no sewers in Tecumseh. Vaults and cess-pools are in common use. These penetrate the upper stratum which is of a clayey nature and enter the gravel beneath. *In this same bed of gravel we obtain our water for domestic purposes.* Gentlemen of the State Board of Health, what property is there in this bed of gravel to prevent the pollution of the water? I believe that the gravel is no better than a sieve, and the sand than pounded glass. I have known crude petroleum to pass through eighty feet of clean white sand into a well. Men generally indulge the pleasing delusion that the earth filters and purifies all fluids. This property does in a great degree belong to the upper stratum. It absorbs and retains plant food and transmutes it into vegetables, fruits and flowers. But sand and gravel cannot do this. Nature has shown a marvelous wisdom in protecting this water by covering it with an earth that will hardly permit any thing impure to pass through it. How we have deranged her beneficent plan! Have we done it with impunity? Have there been no "mysterious dispensations of providence" in our midst? But is it not a wrongful waste of the resources of nature to bury the elements of plant food beyond the reach of plant life? What folly to do this and then, for their necessary equivalents, go to distant islands in the Pacific, for the excrement of birds, and to the prairies and slaughter houses for the bones of animals.

Permit me to point out another cause of sickness and death which I firmly believe belongs to this system. I would not needlessly excite your fears. If I am wrong let whoever will correct me. Does not the same law that governs the movement of the air above the ground prevail also beneath the surface? It will move from the point of the greatest pressure and in the line of the least resistance. Let us go into my friend's house. The furnace is working well and a lively fire in the grate is carrying off the impure air from the floor. The pipe that leads from the sink to the cess-pool is trapped and corked so that no gases can escape. He enjoys his

pleasant home in confident security. Is he safe? Are his wife and children safe? They have not the color they ought to have. There is something wrong here. Let us examine the cess-pool. There is a current of air passing downward in that ventilating pipe. Strange! Where does the air go? Down into the polluted gravel. It then turns toward the house and passes upward through the earth floor into the house.

There must be a bed of polluted sand and gravel from twenty to thirty feet in depth, extending to the water under every privy and cess-pool of long standing. The air must in many cases find its way through these filthy places into the house. We often enter houses that have a disagreeable odor pervading them when the house is neat and the occupants cleanly. From whence does it come? The occupants are not aware of its existence, but the sense of smell constantly violated loses its acuteness. "In one of Prof. Kedzie's lectures he cites experiments made by Professors Marker and Shultz in which they prove that a difference of 20°" in temperature on either side of a wall of brick and mortar would cause eight cubic feet of air to pass through each yard of such wall per hour. The gravel is much less resistant than a brick wall and the difference in temperature is often sixty degrees.

We need to be vigilant to protect our homes.

"There is no flock, however watched and tended,
But one dead lamb is there.
There is no fireside howsoe'er defended,
But has one vacant chair.
The air is full of farewells to the dying,
And mournings for the dead,
The heart of Rachel for her children crying
Will not be comforted."

With aching heart I admit the facts, but I cannot accept the Poet's conclusion—

"Let us be patient. These severe afflictions
Not from the ground arise,
But oftentimes celestial benedictions
Assume this dark disguise."

No! No! These severe afflictions do often from the ground arise. There is not a physician present who has not been able, in many cases, to trace the cause of the sickness and death of a patient to an earthly origin and found that it might have been removed. Scientific discovery has proved that many diseases have their origin in impure water and impure air, and there is no evidence that even one of them has a supernatural origin. Let us not impugn the Divine beneficence. "His tender mercies are over all the works of his hands."

Thus far I have endeavored to show the necessity of sewerage or some method of disposing of excrement. Additional weight will be given to this statement by the discussion to follow and by the paper by Dr. Woodward, on the "Relation of Privies and Cess-pools to Wells." Dr. Jones will give us an article on "The Removal of Excreta and Waste," which is the sole object of sewerage, and I presume will present a better plan for the purpose. I will, however, say what I can for my subject, for some effective measures must be taken to protect the water and the air of our homes from contamination.

It is not my purpose to fill you up with facts and figures until you feel like the "Jumping Frog of Calaveras County" when filled with shot. A thorough system of sewerage, one that would furnish every house with an abundance of water and sewer connections, would be more expensive, owing to our widely separated houses and public buildings, than we could afford. Our people would not be willing to pay for such a system when they have, as they believe, an abundant supply of pure water in their wells. But could we not have a complete system over a part of the town, that would also give the very best protection from fire? One of the principal items of expense in the construction of water-works, in most cases, is the main conduit from the source of water-supply to the city. This expense would be unnecessary in Tecumseh, for the water is beneath us. We can have good water at comparatively small expense. We can have good water if we can protect it from pollution. If it can be shown that privies and cess-pools do pollute the subterranean lake have we no laws to prevent their use?* What practical difference does it make whether a lake is below or above ground! It might be a question whether the shallowness of the river Raisin in dry weather might not unfit it for the purpose, and the health of communities below be endangered. They probably could not prevent us, for it is the custom of villages and cities along the principal rivers to take their water-supply from a point above and discharge their sewerage at a point below in the same stream. The next city filters the water and discharges its sewage below and so on to the mouth of the river. It takes a good filter at New Orleans! This is sanitary engineering on the Ohio river. Not very far in advance of the laws of Moses; but far better than the use of vaults and cess-pools. A system of sewerage may be the only method for the removal of filth that our people will adopt. It certainly was not the intent of your committee that I should give more than a general plan of such a system.

Sink a well near the center of the village, with boiler and steam pumps connecting therewith and with iron pipes laid in the business streets, so that water may be thrown over the highest building. So far as these lines may be extended lay sewer pipe and provide every building with water and sewer connections. The main lines of sewer would run easterly to a main along the street next the river, which would run southerly and easterly to the river at a point below the village. The lines in our streets could be extended as rapidly as property owners would pay for such extension.

The advantages of such a system are the best protection from fire of the business part of the village, the removal of all filth therefrom and an abundance of pure water. The expense of such a system could be equitably divided between the village and the property holders. A small proportion could be paid by the sale of our present water-works to some farmer for watering his stock.

THE NATURAL DRAINAGE OF TECUMSEH IS PERFECT.

The ground gently inclines toward Evans Creek, the river forming an almost perfect natural grade. Any attempt to carry the water from the gutters into common tile drains would simply discharge it into the water beneath us. Tile drainage is only applicable in a soil surcharged with water. Tecumseh is not and cannot be in this condition. Nature has done her

*Those who have no sewer connections should use the dry earth closet.

work well. It is a more thorough system of underdrainage than was ever conceived by man. How puny are our efforts—the laying of drain tile from two to six rods apart—compared to this immense bed of gravel from twenty to thirty feet in depth to the water, and we know not how much deeper it is. You will find the outcropping of this gravel on the east at Blood's bridge, on the north in the banks of Evans Creek and on the west at the railroad cut on Sutton's farm. The day after the heavy rains of last week there was no standing water on our streets. The stratum of clayey earth overlying it was far from being saturated. A hundred cubic inches of dry clay will hold over a pound of water. A square foot five feet in depth would hold 86.4 pounds, equivalent to a rain fall of seventeen inches. The water passes very slowly through it, although in dry weather it passes from the surface very quickly.

It is not probable that this clayey stratum will ever be thoroughly saturated, at least only for a very short time. Such a condition would be prejudicial to health, for the elements of plant food from combustion and decay instead of sinking into the soil would poison the air we breathe and bring upon us those diseases that are common in a new, wet and uncultivated country. I believe that the soil of Tecumseh is in a condition most favorable to the health of the inhabitants.

DISCUSSION.

Henry F. Lyster, M. D., Detroit, member of the State Board of Health, instanced lock-jaw as a new disease of the zymotic class, one in which a specific cause can be separated from garden soil, and vegetable mould, and can be cultivated in "pure cultures."

He also spoke of leprosy as a slowly-developing communicable disease, and of diphtheria, typhoid fever and cholera as rapidly-developing communicable diseases.

He showed how in towns where cases of cholera were isolated, and discharges disinfected, the disease was suppressed; where these precautions were not taken the disease was not suppressed. He applied these remarks to Tecumseh by supposing the introduction of cholera or some other disease. He mentioned the outbreak of typhoid fever at Adrian in a German school which was caused by the discharges from a typhoid patient getting into the well. Many privy vaults were near, but there was no typhoid fever until the germs got into the well.

Filtration through gravel is not sufficient. He recommended the dry earth disposal. If you have a good and sufficient water-supply, you can, with the small sewers, the Waring system, dispose of the waste by sewerage—the rapid system of removal. He thought the tile drain a good thing in this climate for lowering the ground water. He thought the surroundings of the cellar, the nature of the earth, its freedom from impurities, important, because in winter the ground air comes up through the house.

Second Session—Thursday, June 6, at 8 P. M.

After a pleasant and largely attended reception to the Governor, Hon. Cyrus G. Luce, at the residence of J. F. Jenkins, M. D., the meeting at the Opera House was called to order at 8 p. m., by the President, Hon. Geo. Howell, M. D., of Tecumseh. After a vocal solo—"Birds in Dreamland Sleep"—by Miss Agnes Woodward, Hon. Cyrus G. Luce, Governor of Michigan, gave the following address:

THE INTEREST OF THE STATE IN THE HEALTH OF THE CITIZEN.

BY HON. CYRUS G. LUCE, GOVERNOR OF MICHIGAN.

Mr. President—I have on several occasions attempted to respond for the "State of Michigan." The sentiment has been expressed in varied forms, but generally in such a manner as to associate with it the material, natural and developed resources of the commonwealth.

When we think of the State in this connection the mind reaches out to fertile cultivated fields; to the forests and to the mines; to the lakes and rivers and to the finny tribes that inhabit their waters, and to the commerce that floats upon their surface; to the beautiful towns and cities that are scattered all over this fair land; and to the factories and to the shops. And while the subject now presented refers more especially to the State with another meaning, yet the health of the citizen is intimately related to all of these. Their value is enhanced by the robust health enjoyed by the citizen. It is impaired by an enfeebled physical condition, by the spread of violent contagious diseases, by everything that affects the condition of the individual citizen, but for the purpose of this discussion the State consists of the citizens thereof. What are the relations, then, of these collectively to the citizen individually?

It requires no argument to convince the thinking man that the State is interested in the accumulation of property in the hands of its citizens. To enjoy the blessings which our civilization places within the reach of all, comforts must be secured that can only be obtained through the accumulation of something of a competency. And while it may jar upon the feelings of the sensitive yet it is true that, for the purpose of securing the desired results in this respect, every human being in bodily health has a cash value.

They are not placed upon the market and sold as slaves, but as wealth producers they are more or less valuable in proportion to the health they enjoy.

All the accumulations of wealth are secured from one or all of three sources: First, from the soil; second, from the physical manual labor of the citizen. And right here I believe most writers stop and give credit to these two elements for the production of all the world's wealth that has been acquired; but in my judgment there is another agent that comes in that has contributed very largely towards the accumulation of fortunes, comforts, luxuries and enjoyments, and that the list is incomplete without embracing it, that is the brain power. The skill which guides the hand in the discharge of its duties and the accomplishment of its tasks.

Now the individual of strong robust frame and vigorous health is of more value to the State as a comfort and wealth producer than his brother with impaired constitution or broken health. The man with a strong, well-balanced vigorous healthy mind, is a more substantial pillar of society and benefit to the State than the one of weak, sluggish or sickly mind.

So there is a cash value attached to human beings. This is recognized by the common and statute law.

If a life is lost in a railroad disaster through no fault of the individual,

by common consent the railroad company is held liable to pay for the loss. And the same is true if an individual is injured in body or limb. And while juries like assessors of real and personal property will differ widely in their estimate of the true cash value of the property, life or limb of an individual, yet a value is recognized. So divested of humanitarian features, the State suffers a loss in the death of its citizen, and it is under moral and financial obligations to protect the health and life of the individual citizen, that its best and highest interests may be served.

We appreciate the force of this in enacting laws to protect the lives and health of our domestic animals. Their loss is a loss to the State, and a live stock sanitary commission has been created for the purpose of protecting this class of property. They are clothed with arbitrary powers to quarantine, slaughter and destroy, that contagious diseases may not spread and devastate the property of individuals and in this way injuriously affect the value of the property of the State. The same principles in relation to valuation are observed that I have referred to in placing a value upon human life or limb.

A glandered horse in Michigan is supposed to be worth just one dollar. He is destroyed and his owner paid this sum. Alive, he is dangerous to other horses. In good health the same horse would be worth one hundred dollars. And if this principle in relation to live stock is accepted as a correct and proper one by the people, how much more essential is it then that the State in its own interest, guard its individual citizen from unnecessary exposure to contagious diseases, as well as by removing arbitrarily causes which breed and extend them.

It requires no recitation of facts, arguments or logic to convince the people of the State of Michigan that the State has a right—yea more, that it is its duty to go as far at least as we do in protecting the live stock; not to be sure by destroying the lives of the afflicted, but by rigorous quarantine.

This has been evinced by the enactment of laws; (some of them arbitrary in their character) that are intended to accomplish this desirable result.

Our statutes are full of enactments providing for the drainage and reclamation of swamp lands. To promote the health of the people we compel owners of lands to surrender a portion or contribute toward the construction of ditches and drains, that the health of the citizen above them may be benefited.

We have enacted laws establishing boards of health, both State and local, and clothed them with almost arbitrary powers in case of necessity for their exercise to prevent the spread of contagious diseases.

So the principle that the State is closely related to the health of the citizen is well recognized. And while much labor has been performed, and good results obtained yet grander achievements are yet before us. Public sentiment moves slowly. Truths must be presented and reiterated. Not only the profession, but the laymen must grasp these questions if the highest good is to be secured. We have laws enough, and I believe they are strong enough, but the trouble that confronts us is, to secure their enforcement.

To protect the life and health of the citizen we legislate against the adulteration of food that is injurious. The following has been good law in Michigan for many years: "If any person shall knowingly sell any kind of diseased, corrupted or unwholesome provision whether for meat or drink, without making the same fully known to the buyer, he shall be punished by

imprisonment in the county jail not more than six months or by fine not exceeding $200."

"If any person shall fraudulently adulterate, for the purpose of sale, any substance intended for food, or any wine, spirits, malt liquor or other liquor intended for drinking, he shall be punished by imprisonment in the county jail not more than one year or by fine not exceeding $300, and the article so adulterated shall be forfeited and destroyed.

"If any person shall fraudulently adulterate, for the purpose of sale, any drug or medicine in such manner as to render the same injurious to health he shall be punished by imprisonment in the county jail not more than one year or by fine not exceeding $400, and such adulterated drugs shall be forfeited and destroyed."

"If any physician or other person while in a state of intoxication shall prescribe any poison, drug or medicine to another person, he shall be punished by imprisonment not more than one year or by fine not exceeding $500."

This is good, strong law, but it is seldom enforced. I have looked through the report of the attorney-general for the last year, which contains reports made by all prosecuting attorneys of this State, and I fail to find one single case of prosecution for the violation of these wholesome laws. Complaints have been made and prosecutions had for every other conceivable offense.

The truth is, the great crying evil of our times, an evil through and from which we suffer more than from any other cause, is the lax enforcement of our laws; not only those that are intended to promote the health of our people, but others.

It is an easy matter to secure laws both wholesome and possibly sometimes unwholesome, but there must be an arousing of public sentiment to render these laws when passed of benefit to the people. We have laws enough—yes, too many.

Some citizen discovers an evil stalking abroad that may be reached under some existing law, but he straigthway prepares a bill to strangle it. He submits it to his member, and he works heroically until he induces a majority of both houses to vote for it. It comes to the Governor—And of all things that he dislikes to do is to veto a bill—and if it is not absolutely pernicious, it becomes a law to remain a dead letter until the end of all things.

Boards of health are not always guiltless in relation to the enforcement of laws provided by the State for the protection of the citizen.

I was painfully reminded of this last winter when that dread disease—the small-pox, gained such a footing in this state. Some boards of health met the emergency heroically, but others had to be prompted and almost prodded before they would come up to the work. Lives were lost; individuals suffered pain and bear the marks of the disease needlessly through life.

Physicians, preachers, lawyers and citizens should unite in one common effort to secure the enforcement of the law. Thus we see that the State in its material interests is intimately associated with the health of the citizen. It depends upon him and his physicial condition for its prosperity.

But there is a humane side to all this that challenges our earnest, honest attention. None know of this better than the kind-hearted practising physicians. These men see more and know more of human suffering and human woe than any other class of men. We honor those who go out at all hours of the day and night to minister to and mitigate the sufferings of the

sick and afflicted and to smooth the pillow of the dying. Their very calling imposes upon them duties of the gravest and most important character. They know of diseases that others know not of; diseases which poison the blood and destroy the vitality of offsprings, wreck manhood and impair self-respect. And for the very reason that the State is intimately connected with the health of the children, a war, relentless war should be waged against this terrible destroyer. The doctors must be the captains to lead on to victory in this campaign against this terrible vice, one that I cannot here discuss, one that so injuriously affects the body politic and to some extent saps the very prosperity of the State.

And, again, there is another evil which affects injuriously the health of the citizen and causes premature death and loss to the State. It entails monstrous burdens upon the public. It poisons the blood and it, too, punishes the offspring and entails its evils upon the innocent. Our civilization demands individual freedom; insists that if a man wants to make a dram-shop of himself he has a right to do so. That if an individual desires to impair his mental and physical powers the State must not say him nay. But society is interested in each one of its citizens, and in the sweet by-and-by, when society is wiser and holier than now, this great evil must and will be met. For ever and ever we cannot permit the State to suffer for individual violation of the laws of nature.

The health of the citizen is so closely allied to and involved in the welfare of the State, that it must for its own protection exercise its prerogative in sometimes using arbibrary power over the citizen.

Our whole country is now in mourning and humanity is horrified by the awful calamity at Johnstown. If the State of Pennsylvania had placed its heavy hand upon individual citizens at the right time and in the right way, the horror might have been avoided. But I will not follow this painful subject.

In the line of improvement in the health of the citizen the physician must be the reformer. Of their practice, personally I know but little. I have always admired the doctors, but this admiration is highest when I gaze upon them at a distance from my own bedside. In this case it is emphatically true that "distance lends enchantment to the view." But sooner or later we must all fall into their hands.

Judging by the ordinary standards adopted for estimating the actions of mankind, we might naturally conclude that as the practice of the physician is increased and profits enhanced by the prevalence of disease that he would be slow to aid in checking its spread. But be it said to their honor that physicians are the very men that are usually pointing out the road to health.

I rejoice in their medical associations and sanitary conventions and in all efforts that are intended to benefit the human race.

THE PUBLIC PRESS AND THE PUBLIC HEALTH.

BY C. F. FIELD, TECUMSEH, MICH.

If Archimedes had lived in these modern days he would have modified his well-known proposition and said instead, "Give me a printing press and I will move the world." The power of this great machine is so apparent and

so universally recognized as to admit of no argument before an intelligent audience. Its power is not only great, but all-embracing. There is no phase of modern life which the press does not influence, no domain of human thought which it does not enter. True, it sometimes "steps in where angels fear to tread," and becomes involved in error, but it is, nevertheless, the greatest teacher of the age.

It seems, therefore, proper that a discussion of its relations to, and influence upon, the public health should find a place in the program of a sanitary convention, such as this. If the press is so influential in shaping public opinion, and is so mighty an engine for the dissemination of ideas, it must have a work to do and a responsibility to meet in promoting and guarding the public health.

The term "Public Press," in its broadest sense, includes all products of the printing press designed for public perusal, whether in the form of newspapers, magazines or books, and the phrase "Public Health" comprehends in its fullest sense, not only the physical well-being of the community, but the mental and moral welfare as well. For the physical, mental and moral attributes of man are, to a certain extent, interdependent, and exercise a mutual influence upon each other. The subject, therefore, which I am called upon to consider, embraces a great deal when taken in its widest signification. But it is particularly the influence and responsibility of the newspaper in relation to the public health that I will discuss in this paper.

That the newspaper has much to do with the health of its readers may seem at first glance, somewhat improbable, but a closer consideration of the matter will show that the newspaper is an important factor in the promotion of public health and the advancement of sanitary reform.

In the first place, it is the medium through which ideas reach the people quickly. The proceedings of this convention, for example, will, no doubt, be eventually published in a large volume, * in conjunction with the proceedings of other similar conventions and accompanied with much other matter pertaining to the health of Michigan. * The volume when published will be a valuable one, no doubt, containing, as it will, the latest discoveries in sanitary science and the latest statistics in the vital history of the State. * It will be published and distributed by the State authorities and will find its way to every physician's library and editor's sanctum in the State,* there to take its place beside a long array of black-bound, dust-covered, unattractive looking "Health Reports." It may contain facts of great importance, but whoever thinks of consulting it? *

The newspaper, on the other hand, seizes upon every newly-discovered fact, every newly-advanced idea, and lays it before the eyes of the people

*[The author of this paper is laboring under a wrong impression. The proceedings of this convention are published (in this pamphlet) but not "in a large volume" and not "in conjunction with proceedings of other similar conventions, and accompanied with much other matter pertaining to the health of Michigan." It may not contain "the latest discoveries in sanitary science, and statistics of the vital history of the State;" but it will contain a useful account of the proceedings of this convention. It will be distributed by the State authorities, but it will not "find its way to every physicians' library and editors' sanctum in the State," because there is not a sufficient number of copies printed to supply one-half of those persons, and, besides, they are not sent to those persons exclusively, but only to persons believed to be interested in and thus likely to read them. Being sent to those only who are supposed to be interested in them, the pamphlets *are* frequently consulted. The newspapers perform a very useful service, especially when they use such printed material as they find in such pamphlets as this; but their reports of sanitary conventions being from notes written very hastily, it is important to have, for use by those who are studying or teaching these subjects, statements which are more reliable; and these pamphlet proceedings of conventions supply fairly reliable statements bearing upon questions in sanitary science and public-health administration which were considered of interest and importance in the locality in which the convention was held, and thus likely to be important in many similar places in other parts of the State.—*H. B. B., Sec. State Board of Health.*]

almost as soon as it is uttered. Whatever of value is promulgated in this convention by the learned gentlemen who are specially qualified to teach the public the laws of sanitation is immediately given to the public by the press. If these gentlemen advance new and important truths concerning ventilation, drainage, the prevention of contagious diseases, the building of houses, the location of wells, cess-pools, sewers, etc., the people ought to be acquainted with these facts at once. They are matters of vital importance to health, without which life itself is an affliction, and therefore ought to be known as soon as possible and as widely as possible. The newspaper is the only practicable medium for accomplishing this desideratum.

Again the press plays an important part in sanitary education by reason of its universality. The learned scientist may speak ever so eloquently, yet his audience is a limited one; the minister may preach that cleanliness is next to godliness, and that purity of life, abstinence from sinful indulgence, and a consistent, Christian life, tend to promote health of mind and body, but his admonitions are heard by his own faithful flock alone; the school teacher may inculcate the laws of temperance and health, but he can influence only the immature mind of childhood; but the press reaches all classes. Whatever it may say on matters of health finds an audience as broad as civilization.

Then again, the press in its capacity as a news gatherer has an important influence upon the public health. If the cholera breaks out in a southern city the news is immediately proclaimed throughout the land, and steps are instantly taken to prevent its spread; if the smallpox gains a foothold in any community in Michigan it is at once known everywhere, and the people are warned from running into danger; if diphtheria or scarlet fever becomes epidemic in any locality the news is spread through the daily press, the authorities are prompt to take precautionary steps, and the whole community is stimulated to the exercise of extraordinary vigilance. Thus, in its line of duty as a disseminator of news, the press acts powerfully, even though indirectly, upon the health of the public.

The duties and responsibilities, then, of the public press with reference to the public health are of a general, and not of a specific, nature. It belongs to the medical profession and to the scientific investigator to discover the nature and cure of disease; to the State to make laws and sanitary regulations promoting the public health and preventing the spread of disease; to those intrusted with executive powers to see that these laws are enforced; and to the press to disseminate information concerning sanitary subjects among the masses.

Unless the people are made to realize the importance of obeying all reasonable sanitary regulations, and are taught the danger of neglecting them, the work of our boards of health and the researches of our physicians and teachers of sanitation will be but half accomplished. The press, therefore, plays an important, even though secondary, part in the advancement of sanitary reform.

There is, moreover, a higher sense in which the public health may be considered. A people effeminate, corrupt in morals and dissolute in habits is necessarily physically weak and subject to the inroads of disease. By inculcating, therefore, a high standard of public morals, by advocating those principles of chastity, temperance and integrity of life which lie at the foundation of national vigor and constitute the prerequisites of "a sound

mind in a sound body," the public press will fulfill its highest mission as regards the public health.

DISCUSSION.

This subject was discussed in an entertaining manner by Scovel C. Stacy, of Tecumseh.

THE WATER-SUPPLY OF TECUMSEH.

BY HON. GEO. HOWELL, M. D., OF TECUMSEH.

Water from the natural water-supply of Tecumseh is abundant, pure and healthful.

In this one sentence I give the result of my investigations. With it I might close. But then I would not convey to the convention and to my townsmen the facts that have led me to this conclusion. Neither would I point out the way in which our water-supply may become infected with disease-causing germs, nor how it can be kept wholesome from generation to generation.

In order to bring about such an understanding of the subject as will be of practical benefit, I shall have to call your attention to the geological formation of the beautiful plain upon which the village is located.

Tecumseh is located on a gravelly plain, near its northern limit. The plain extends from northeast to southwest about four miles and from east to west from one-half mile to two miles. The Raisin river flows from the north, cuts a little into the plain, then turns eastward and runs along its eastern border. Evans Creek flowing from the west has its course through the plain near its northern limit and empties into the Raisin.

Tecumseh is located on the plain at the junction of the creek and the river. A layer of clay crops out both on the eastern and western borders of the plain. It is quite probable that this stratum of clay underlies the whole plain, and forms a deep clay basin. This basin, if there is one, is filled with strata of varying thickness composed of sandy clay and gravel.

At the Globe Mill gravel pit, in a perpendicular of about twenty-five feet I counted thirty-one distinct layers of said clay and gravel. At the Evans Creek gravel pit I counted eighteen layers. At the C., J. & M. R. R. pit I was not able to count the layers, the surface earth having slid down the bank, covering them from view. But for a depth of about thirty-five feet there appeared to be a bed of almost solid gravel, having a great number of layers of different degrees of coarseness. These three gravel pits—one on the east, one on the north and one on the west of the village—give a pretty good idea of the geological formation of the plain to the depth of twenty-five to thirty-five feet. In the western part of the village, as we descend from the surface for a depth from two to five feet, we find a mixture of sand and gravel containing a great quantity of cobble-stone, then to a depth of from forty to fifty feet we find loose sand and gravel in many distinct layers and of different degrees of coarseness. In the eastern part of the village, below the mixture of sand, gravel and cobble-

stone, we find a layer of clay. In places there is a bed of cobble-stones just above the clay, and in other places just below it. The layer of clay varies in thickness from four to ten feet. From below the clay to an unknown depth we find loose sand and gravel, as in the western part of the village.

If the gravel, sand and clay of the plain upon which Tecumseh is located could be removed and the excavation or basin filled with water, we should have a lake several square miles in extent. The bottom and shores of the lake would be the stratum of clay of which I have spoken as cropping out on the eastern and western borders of the plain. Now up to a certain level the sand and gravel in this imaginary basin is filled with water. This water is the natural water-supply of Tecumseh.

The extent and depth of the basin, or rather the water-bed in the basin, is such that the supply of water is practically inexhaustible. This water-bed underlies the whole village. The water in the water-bed is not stagnant, but it apparently flows to the east. The springs along the creek and river banks are the natural outlets of the accumulating waters in this subterranean supply. The water level in the water-bed is the same in all parts of the village. It is at a depth varying from twenty-two to fifty feet, according to the elevation of the surface of the ground.

For greater accuracy of information Alexander Richards, of Raisin, an excellent civil engineer, took the level from the surface of the river at the bridge below the Globe pond along the line of Chicago street, to the western limit of the village.

I append a map showing the elevation of the surface, the water level in the water-bed and the depth of wells on Chicago street.

Now all the wells in Tecumseh except those on creek and river bottoms penetrate the earth into this water-bed. They all have one common water-supply. They are from 22 to 50 feet deep, and the water is very pure.

Through the kindness of Dr. Victor C. Vaughan, of the State University, I am able to append an analysis of a sample which was taken from the well of our Secretary, Dr. L. G. North, and which is a good sample of the natural water-supply.

On examining the analysis you will find the water to compare favorably with the best water in the State.

RESULTS OF ANALYSIS OF WATER FROM WELL OF DR L. G. NORTH, RECEIVED FROM DR. GEO. HOWELL, OF TECUMSEH, MICH.

	Parts per Million.	Grains per Gallon.
Free ammonia	0.037	0.00215
Albuminoid ammonia	0.078	0.00455
Chlorine	10.0	0.58
Nitrates	A trace.	
Nitrites	None.	
Hardness	17.5° Clark's scale.	

No absolute standard for the purity of drinking water can be given, but good authorities agree on the following rules:

(1.) The chlorine ought not to exceed 10 parts per million.

(2.) The free ammonia ought not to be more than 0.05 part per million.

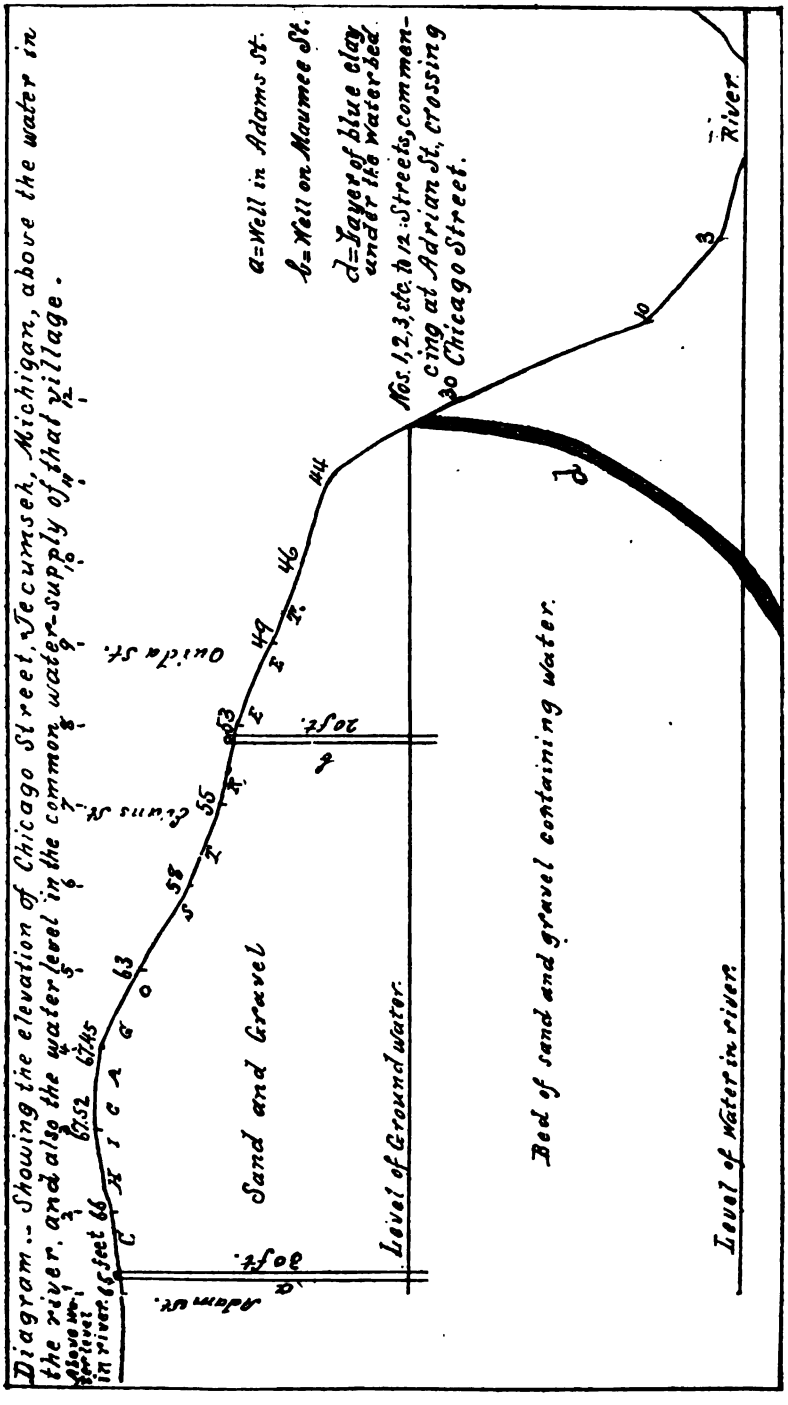


Diagram.—Showing the elevation of Chicago Street, Tecumseh, Michigan, above the water in the river, and also the water level in the common water-supply of that village.
a=Well in Adams St.
b=Well on Maumee St.
d=Layer of blue clay under the water bed.
Nos. 1, 2, 3, etc. to 12. Streets, commencing at Adrian St. crossing Chicago Street.
Adams St.
Ouida St.
Clinton St.
Chicago
Sand and Gravel
Level of Ground water.
Bed of sand and gravel containing water.
Level of water in river.
River.
30 ft.
20 ft.
Level of water in river 65 feet
Above mean level in river
6752
6745
63
58
55
49
46
44
30
10
3

(3.) If 0.10 part of albuminoid ammonia be present the water should be regarded as suspicious.

(4.) If 0.15 part of albuminoid ammonia be present the water should certainly not be used.

Judged by the above rules, this water comes within the limit of good waters.

Indeed this is the best water among some 40 or 50 samples which we have examined this winter.

No pathogenic germs could be found in it.

Respectfully,

V. C. VAUGHAN,

Director of the Michigan State Laboratory of Hygiene.

May 28, 1889.

Of its healthfulness, there can be no better proof than the sixty-five years of use since the settlement of the village. Typhoid fever seldom occurs within the village, and cases of dysentery are rare, while in the clay country lying both north and east of the village these diseases occur with greater frequency and fatality.

I have now called your attention to our natural water-supply and to its abundance and healthfulness. I said that all the wells had one common water-supply, and that the water in the water-bed flowed to the east. Then it follows that if a well becomes infected with disease-causing germs, the well next on the east is liable to become affected from it. If this view is correct, then all the citizens of Tecumseh are interested in each citizen keeping the water in his well wholesome.

How may water become unwholesome?

For twenty-five years or more physicians have been looking through the microscope into fields of wonderful interest. They have been studying microscopic objects in these fields with great care. In them they have discovered germs that they believe to cause disease. Dr. Jenkins, in his paper to-morrow, will fully treat upon the part these germs play in their effects upon health. I can allude to them only so far as they are liable to infect our water-supply.

The eye delights in vegetable growths, from the smallest fern to the largest redwood of the Sierras. Descending the scale of magnitude beyond where the eye ceases to perceive, the microscope reveals an innumerable variety of living objects so small we call some of them bacteria cells or germs. A single one may not measure the ten thousandth of an inch in diameter. Certain varieties of these are disease-causing germs. When taken into our bodies they cause us to sicken and die. A family, a brood of half a million of these, may inhabit and infect a single well. It has been ascertained that they thrive and multiply in water where there is decaying matter. It is also established that certain of the disease-causing varieties are taken into our bodies in the water we drink and thus cause sickness and death.

How do they get into the drinking water? They get into the open or dug well. How? The surface water containing the components of the soil runs into the well. Bugs, angleworms, toads and snakes fall into it and die; men and women wash their hands and feet on the platform and the water trickles into it; ducks waddle in the little pool where the water runs from it; chickens scratch for worms in the moist earth near its wall,

and horses drink and slobber in the tub under the pump spout. From these and perhaps from other sources there accumulates on the wall and in the bottom of the well a soft, slimy deposit of decaying and offensive matter. Here in this we have a favorable soil for the planting, the increase and the development of disease-causing germs. Now when the summer sun warms into activity the myriads of creation's multiplying, fructifying host and every nook has life, these wells do not escape. In deference to man's lofty genius, Providence makes no exceptions, but in the well—if it be filthy—plants invisible germs. We drink these germs—these scavengers of filth—we sicken, we employ a doctor to oust the little demons, and we invite the pastor to ask kind Providence to mitigate his just asperities.

How shall we keep the water-supply healthful? The way is easy and the work is practicable. If the open wells, the cesspools and the privy vaults were refilled with earth, and all the slops thrown on the surface, I do not believe the natural water-supply would become contaminated. For, with our natural drainage, aided by our street drainage, before the melting snows of winter, the rains of summer, and the house slops of the dwelling could percolate through the various strata into the natural water-supply, every impurity would filter out. How, then, shall the supply be kept pure? Let the common council examine the open wells, and where there is negligence or carelessness have the driven well placed in it and the well refilled with earth. Let us also require that all wells hereafter sunk shall be driven wells. Let the council see that the cesspools and privy vaults are not dug to the same depth as the well, and the contents poured directly into the water-supply, but that they be shallow and often changed from one place to another.

But of privy vaults and cesspools, and the dangers that arise from them, Dr. C. M. Woodward will treat in his paper tomorrow.

From my investigation I can arrive at but this conclusion: The natural water-supply of Tecumseh is abundant, pure and healthful; the danger of contamination arises from the open wells, the cesspools and privy vaults, and that danger may be almost wholly avoided by the use of the driven well, shallow cesspools and privy vaults, the cesspools and privy vaults to be refilled with earth as used and frequently changed in location. Thus, with due care on the part of the village authorities, the water-supply may be kept in its natural and healthful condition from generation to generation.

DISCUSSION.

Henry F. Lyster, M. D., member of the State Board of Health, in opening the discussion, referred to the analysis of the sample of water, and thought that the chlorine in such large quantities rendered the water suspicious. Though the water may be comparatively fair water, there is a constant liability of contamination so long as there are privy vaults. If we get pure water which has passed through the soil, we must have a pure soil. Though you may have no disease here at present, the time will come when you will have an epidemic if the germs of typhoid fever once get introduced. The only safe way is to completely dispense with those ancient heritages of filth—the privy vaults. The best sanitarians are opposed to them, and the best sanitarians are opposed to wells where it is possible to have a public water-supply.

A. Arnold Clark, of Lansing, referred to the outbreak of typhoid fever at Iron Mountain, Michigan, where three hundred and fifty cases and thirty-five deaths were caused by contamination of the well water through the germs from one case of the fever. Those cases might have been prevented if people had boiled the drinking water, as it is known that boiling the water will destroy the germs

of this disease. There are 1,000 deaths from typhoid fever in Michigan every year, and 10,000 cases. If, as the Governor has stated, every life has a cash value, and if we estimate every life as worth one thousand dollars to the State—and slaves sold for that in the market—if every typhoid patient is sick thirty days, when we come to reckon up the cost of nurses and medical attendance and the loss of wages, we begin to see what a financial panic it is to have in our midst this disease which is caused by contamination of the water-supply.

One-third of all the deaths which occur in this State every year are from diseases which we know enough to prevent but do not. This evening allusion has been made to the great catastrophe at Johnstown. For days the newspapers have been filled with the sad and sickening details of this dreadful calamity which swept over the Conemaugh valley, destroying probably ten thousand lives. And yet the sad, the solemn, the awful thing about this calamity is that it might have been prevented. People knew that the dam was unsafe, and yet they continued to live with this great ocean of water above them. But there are in Michigan *every year as many deaths from diseases which are preventable.*

The great enemy of man is preventable disease—a greater enemy than war—and yet we pay thousands of dollars to maintain a large standing army to protect us against those foreign foes with whom we ought to be at peace. How much more reason to maintain a large and well-paid army of health officers to protect us against this army of disease germs.

Third Session—Friday, June 7, at 9:30 A. M.

PUBLIC HEALTH IN TECUMSEH.

BY SAMUEL CATLIN, M. D., OF TECUMSEH.

As I understand sanitary science, it has for its object all the surroundings and conditions of life in connection with laws, regulations and measures bearing upon health, consequently it has a vital interest for every member of the community whatever be his condition in life. His personal comfort, health and safety demand constant vigilance on his part to guard against disease and its causes, and for the most part every man must be his own protector. Hygiene, the study of the sanitary relations of man to the exterior world, and of the means to make these relations contribute to the greatest good, comfort and safety of every individual, should be the highest office of the philosophic physician, and the prevention of diseases his most important function. The subject assigned me for presentation before this convention—"Public Health in Tecumseh"—is a long one. It comprises a period of time extending over 62 years, dating back from its first settlement half a century or more, and if recited would be nothing more or less than the story of the opening up and settling of almost any new country by emigrants from different States, their hardships and privations, in seeking and preparing a home for themselves and families.

The sanitary condition of Tecumseh for the past half a century and more has been nothing more or less than a settlement of a class of people, lovers of good laws, good order and good health. The geographical situation attracted people here for a home (many of the pioneers are here yet, at a ripe old age). Tecumseh is situated upon a gravel, loam soil, with natural drainage, pure water-supply from wells, and pure air, two of nature's greatest gifts. We have on the north and east, Raisin river, not a sluggish

stream, also Evans creek on the north half of our village, consequently our surplus water has ready flow toward the lakes, thus giving us immunity from disease. Our pleasant village situated in a healthy location, inhabited by a thrifty, enterprising people, received its charter from the Territorial Legislature in the year 1824,—thirteen years before Michigan became a State. The original plat of ground of this village was secured and located by Messrs. Wing, Evans & Brown,—Evans being a surveyor. The village was laid out with a system of regularity, which has been maintained in all its additions to this time. The charter of the village was procured early in the year 1824, and a village council elected and maintained from year to year, till in 1837, Michigan became a State. Then it was organized under the State law. Since that time, as our State legislators have passed laws for the regulation of the public health, our village board has had an eye to the observance and execution of those laws.

As far as I can gather any data, from the first settlement of this village, it never has been visited by an epidemic of any kind. The diseases have been mostly of a sporadic nature, arising from accidental and incidental causes. I do not wish to have it understood that this is the healthiest place in the State, nor that we have been or are to become what Sam Slick termed his good town of Slickville, "an arthly paradise." We have had malarial fever, but little if any which could be called typhoid; we have had measles, scarlet fever, and most if not all allied diseases incident to childhood.

We have had the visitation of small-pox here but three times in the history of our village. Being imported, it was easily confined, controlled and soon ended. Our death-rate as far as I can gather, from those preceding me, and from observation, has been no more than the general outlet of human life, from general causes. People will sicken and die, under any form of government, good or bad. No form of sanitary laws can wholly prevent it, but they can prevent disease and lengthen life, and thus lessen mortality.

People in any community should be as vigilant and anxious about their health as they are in all their ordinary dealings, considering that "an ounce of prevention is worth a pound of cure," that good health is much easier lost than won. Nature is not so mutable in her laws that they can be changed by the caprice of every individual, as a hatter would change the crown of your hat, or a milliner the trimmings of a bonnet. Her laws are fixed and stable; her decrees are unrelenting, and the penalty is sure to come.

As a tribute to older physicians and citizens who have preceded me, and a duty to the public, I must give them credit for the early history of the sanitary condition of Tecumseh, as some of them were more or less active in the early sanitary history of our beautiful village.

One of Tecumseh's foremost citizens and most active physicians was Dr. M. A. Patterson, who settled here in 1827, at a time when but few people were here. Being then a young, active man of sterling worth and integrity, he with others at that time assisted in doing the pioneer work for the foundation and government of our peaceful village, as it has come down to us to this day. Dr. M. A. Patterson came here in 1827. He was much interested in the work of education, with other pioneers, Messrs Bills, Le Baron, Baxter, Stacy, and others, in laying the foundation of our present schools and the advancement of all educational interests, as well as other improvements of this prosperous village. Dr. Patterson, coming here in an early

day, was the first practising physician here and the only one for a number of years. Being an emigrant with the rest, in a thinly populated country, having to suffer discomforts and privations with others, his ability as a physician, his worth as a man, his ever ready willingness to give counsel and aid to others as a physician or friend, gave him the lasting love and respect of the people to the time of his death in 1877. Dr. Patterson was identified with our schools from their early history till the time of his death, extending over a period of time in our village history of one-half a century. Dr. Patterson was many times president of our village board, and always took a deep interest in our local affairs. His early connection with this village and his long experience extending over so long a time gave him a prestige man seldom gets. He has often told me, in speaking of the general health of the village, that he had never known of an epidemic of any kind here, that the diseases were of a malarious nature, such as could generally be expected anywhere in this climate; he had seen diseases of a low grade, but nothing he could call typhoid.

Dr. Wm. Baldwin, one of the oldest physicians, has given me about the same health history as Dr. Patterson. Dr. Wm. Baldwin came here in 1836. He was a most intelligent and successful practitioner, never, however, taking an active interest in local affairs, and he was much respected as a man and as a physician. He died in 1864, being a physician of active business for 28 years.

Hon. Perly Bills, who came here a young lawyer in 1837, was much identified with the building up of our thriving and prosperous village and promoting its sanitary interests. He was connected with the educational interests of our schools from the time he first located here, in 1837, till the time of his death in 1880, extending over a period of time in the history of this village of 43 years.

C. A. Stacey came here in 1836, being a lawyer by profession. He was very active in all matters pertaining to our village for a great many years and was connected with our educational interests most of the time until declining health and age retired him. He died in 1888, having been a resident of the village for a period of 52 years.

There are many old citizens, some of whom are here, others have passed hence, of whom I would speak, but time will allow only a mention of a few who were more or less active in helping to make our healthful village what it is. Among them are the Andersons, Adams, Adam, Baxter, Brewer, Lilley, LeBaron, Nichols, Wood and Wright; hosts of others pass and repass before me, but time and space will not permit me to mention them.

A great many people think, as it would appear, at the present time, that sanitary reform, or the prevention of disease is a new thing, and look upon it with suspicion. I refer those who are skeptical upon that point to the scriptures, where they can learn that the Jews lengthened out their lives by the strict observance of hygiene in the Mosaic laws. The salvation of life is one of the first instincts of man, and is of no less importance to a people than the prevention of sickness and disease. They have been handed down to us from all time.

It matters not whether sanitary reform is of ancient date or of more modern origin, whoever has to do with it, whether he be physician or layman, will have the same contingencies and general apathy on the part of the people to contend with, which will in time disappear, as the people become

more enlightened on the subject. I have often thought that if the people would give more attention to their sanitary condition and to the prevention of disease, and less attention to some nostrum to cure some imaginary trouble, they would be far better in health and increase their chances for a long life. People will sometimes, through ignorance or neglect, from mere habit of selfishness or for mere profit, maintain an unhealthy condition of things, either to the injury of those under their control or much to the annoyance of their neighbors. I once had a case of that kind, which I will relate: A number of years ago I was called to see a family living in a tenement house, owned by a man who had formerly occupied it for quite a number of years, but who had built a new one on the other side of the lot and moved into it. The owner of the house, before he built the new one, concluded he would slick up the old house and arrange all its surroundings handy and convenient, so that it would bring more rent, and he did. I found all the children sick with fever and calling for water, and they must have it fresh from the well. I visited them for several days, was very much puzzled with the type of the fever, and had made inquiries about their surroundings which almost amounted to impertinence. Therefore I made up my mind to inspect the premises. Going out of the back door, I found the well about ten feet from the house and the privy between the well and the house, which left the privy within about five feet from the well. I condemned the well and they went to a neighbor's for water. My patients were soon convalescing. The family soon moved out and left the house empty. The owner came to me in a few days in great anger, saying I had done him a great injustice, bringing a sample of water to test. He told me the matter must be fixed up, as he had a certificate from a physician saying that the water was pure and had no connection with the cause of the sickness. As I could be of no comfort to him, he left and kept away.

There is no class of men of more value to a State than those who make the sanitary relations of the people their study, to promote their hygienic condition. Hygiene increases the happiness of a people. Health is not like the equilibrium of a body at rest, for it implies life, which is a condition of incessant changes, of loss and repair; consequently any disturbing cause, whether from without or from within the system acts the rôle of what we call disease. Man, to maintain his existence and enjoy good health, must have air, food and water. He can not live without either; at the same time he may find lurking in those very elements myraids of low organisms called germs, enemies which may cause his destruction.

The part which almost all germs play in nature is very important. It is a settled fact, that certain species live in dead organic matter and are the direct cause of putrefaction. By their action on the dead bodies of animals and plants, all decomposing material is resolved into substances which can be incorporated with the soil, water or air. Thus it can plainly be seen that with our food and drinks and the air we breathe, they can be readily introduced into our systems and once in the blood stream they are carried swiftly to every part of the body.

Hygiene will in all its investigations and its teachings show to every one in all situations in life, that he is at all times assailed by enemies from without and foes from within. Can it be wondered at that it was said of old, "mankind are most wonderfully and fearfully made."

DISCUSSION.

Henry B. Baker, M. D., Secretary of the State Board of Health, Lansing, in opening the discussion, said that he did not learn from the paper the number of physicians in Tecumseh at the present time. (Dr. Catlin replied that there were eight.) I am informed that eight physicians are supported in this city for the treatment of diseases after they come—eight men are employed to cure you when you are sick. You also have one man who is employed to prevent disease. Now how much do you pay him? (A voice—fifteen dollars.) Yes, you pay eight doctors a thousand dollars each to cure you when you are sick, and you pay one man fifteen dollars to prevent your getting sick. You should at the least pay your health officer as much as you pay any one physician to cure you; especially if an ounce of prevention is worth a pound of cure. What kills the people of Tecumseh? (A voice—"old age.") That may be, but I imagine that a great many people in Tecumseh die of preventable causes. I hope that you will find some way of putting on record the causes of deaths. There is a great need everywhere for better statistics, and I imagine that if the facts were known it would be found that some die right here in Tecumseh of typhoid fever. This we consider a preventable disease—a disease usually spread through the water-supply. The necessity of looking after your water-supply can not be repeated too often. The gentleman who discussed this subject yesterday wanted you to take your supply from the center of the city. Before you take this course you should consider the possibility of this water-supply becoming fouled. When the germs of typhoid fever get into a private well, there is a local outbreak, but when a few years ago the entire water supply of Plymouth, Pa., became contaminated with the germs of typhoid fever, there were one thousand cases; so if you were to sink a well in the center of this city, and the germs of typhoid fever should get into that well you might have a thousand cases of typhoid fever in your city. Before you put money into such a supply you should carefully consider whether it is the best place to get your drinking water.

I imagine that there are some who die in Tecumseh of another communicable disease—consumption. One out of every eight persons who die, dies of consumption. It causes more deaths than any other disease, and it is a disease which is preventable. Diphtheria and scarlet fever also cause each year a large number of deaths, and both of these diseases are largely preventable. The methods of prevention are isolation and disinfection. Where these methods have been followed it is proved that these diseases have been prevented, and lives have been saved.

Rev. J. S. Joslin said that it had been his privilege to attend other conventions and he had found them very beneficial, but not if a locality started out with the proposition that sanitary conditions were perfect. It is a fact that our drinking water comes from a soil perforated with vaults and cess-pools. These eight physicians are all doing good business. His opinion was that there was not a well in Tecumseh the water of which was fit to drink.

Prof. Delos Fall, member of the State Board of Health, Albion, emphasized the necessity of a public supply, but urged the importance of going to the rock for the supply, and then guard against surface contamination. As far as an analysis of water is concerned, if a careful microscopic examination reveals an absence of deleterious germs, that does not insure that an examination tomorrow may not reveal those germs. There is a path along which they may thrive and tonight the germs may be dropped into your vaults and find their way into these wells. That is to say, you are in danger.

SCHOOL HYGIENE.

BY PROF. EUGENE A. WILSON.

Nothing in connection with school management can be of greater importance than the preservation of the health of both teacher and pupil. Not only a knowledge of the laws for preserving health, but also a strict compliance with these laws, is necessary. "The laws of health," says Dr. Willard Parker, "are the laws of God, and are as binding as the

decalogue." "The fact is," says Spencer, "that all breaches of the laws of health are physical sins." "Nature's discipline," says Huxley, "is not even a word and a blow, and the blow first, but the blow without the word. It is left for you to find out why your ears are boxed." No education is worth the cost if gained at the expense of health and cheerfulness, or under the penalty of nervous weaknesses, dyspepsia, or near-sightedness.

A sound body is the groundwork of sound intellectual faculties. A morbid condition of body leads to dullness of mental perceptions and weakness of the intellectual faculties. Excessive or premature mental development checks the growth of the body; over-development is antagonistic to growth. Dr. E. H. Clark says: "Educate a man for manhood, a woman for womanhood, both for humanity." "Get health," says Emerson, "for sickness is a cannibal which eats up all the life and youth it can lay hold of, and absorbs its own sons and daughters." Mental labor rightly directed is a most healthful occupation, and there is no real reason why this should not be true at all periods of school life. "At college," says Horace Mann, "I was taught the motions of the heavenly bodies, as if their keeping in their orbits depended upon my knowing them, while I was in profound ignorance of the laws of health of my own body. The rest of my life was, in consequence, one long battle with exhausted energies."

The character of the citizens of the future will be determined, to a great extent, by the character of the schools of today. The advancement of the schools depends upon the physical as well as the mental and moral training of the pupils. It is said that the children of American families are declining physically—perhaps true. Are not the children of this generation suffering from the indulgences of our forefathers? Another reason assigned is, "too much education."

This subject is one of vital importance to all: to school officers that they may properly construct and arrange school buildings; to tax-payers, that they may realize "value received" for money expended for school purposes; to teachers, that they may care for the health of pupils; to physicians, that they may enlighten others less favored with opportunities for scientific research; to fathers and mothers that they may perform their duties acceptably. While I do not expect to instruct the members of this convention, I do hope to receive enlightenment from others.

School hygiene has special reference to the following in connection with the school-house and the pupils. (1) Lighting. (2) Heating. (3) Ventilation. (4) Condition of floor and walls. (5) Position. (6) Exercise. (7) Hygienic habits of pupils.

Light is very essential to health. Dark rooms are never so healthful as those properly lighted. Many diseases of the eye with which they who work in-doors are often afflicted might be avoided if the laws for the preservation of sight were properly understood and observed. The windows of every school building should be high rather than broad and low. The nearer to the ceiling the light enters the room, the more nearly will nature be imitated in giving us sunlight from above. The windows should, as far as possible, be placed only on the sides of the room, and come to the page from over the left shoulder, and never in such a position that the light will strike pupils in the face. Curtains and shutters should not be used for shutting out the light or the sunshine, but for modifying it and preventing injury to the eyes by its glare. Curtains should be of such material as will intercept as

little of the light as possible. Books with small type should, as far as possible, be avoided. One of the evils with which we have to contend in this age of cheap books is the small type in which so many are printed. Narrow pages and good sized type with ample light would do much to preserve the eyesight of our children.

As to heating, the temperature of the school-room should be such that every occupant is comfortably warm whatever part of the room he may occupy. With a stove in the center of the room this is almost impossible. No more defective plan of heating a school-room could be devised than this. Those in the immediate vicinity of the stove are too warm, those near the walls are too cold, and in either case the foundation for disease is laid. All plans of heating can be improved by proper ventilation. Some say that steam is better than hot air, others tell us that the open fireplace is the most healthful where wood is plentiful, and the draft created is also beneficial in connection with proper ventilation of the room; some say that with hot-air furnaces the air becomes parched and too dry, thus often causing very serious diseases of the throat, and that with steam the air is too moist. On the other hand, expense must be considered.

Allow me to say that the plan adopted by the school board of Tecumseh, now in use at the central building and also at the west branch, is perhaps the best system in use.* With proper management there is no question but that the temperature will be even all over the room, and plenty of fresh air supplied to satisfy all demands. I am indebted to Isaac D. Smead & Co., Toledo, Ohio, for material for this part of the paper. Smead's system is the one in use at the buildings above named. "One writer tells us that the air should contain but little moisture, another says it should contain a large amount; one says air should enter the room at the ceiling, another at the floor; and another, to avoid the mistake of either, says it should come into the room halfway between ceiling and floor." One writer says the exit should be at the ceiling, another at the floor, another halfway between the two. One says moisture should be added before it is warmed, another says after, and still another that it should not be added at any time. One writer tells us that the fresh air ducts should commence high up in the heavens somewhere, then only pure air will go into the building. If this were the case people should have been allowed to grow not less than forty feet high, instead of from four to six. As a rule dogs enjoy good health, and they don't get air from a very high elevation. One writer tells us that "ventilation can be secured only by the use of a fan or mechanical system;" another that "the natural system is the only one that should be considered." One tells us that "the air is full of dangerous bacteria;" another says that "bacteria are not dangerous;" and another swings his pen to say "they are dangerous only under certain conditions." And others commence quarreling in trying to decide what these conditions are.†

How wondrously wise was the kind Providence that surrounded us with this omnipresent, pervading and diffusive ocean that we call the atmosphere. How easily it diffuses all obnoxious and poisonous matter. Man has only to appropriate it to be blessed. The struggle of today is with impure air—impure because vitiated, and vitiated because man seeks to thwart the operation of the beneficient laws of nature by which she would abundantly

* [This subject is discussed at length on page 37 and subsequent pages.]
† [See discussion on page 37 and subsequent pages. H. B. B., Sec.]

care for her children. Wherever children or people are massed together, dangers from impure air increase in proportion to the massing together. Consumption, a disease almost unknown during the colonization period, has increased with the growth of the country. The one part of carbonic acid everywhere present in every 2,500 parts of air is rapidly increased by the breaths of the masses, besides the decomposing matter exhaled from the lungs and the effluvia from the body rapidly increases the impurities. Take it in a school of from 500 to 900 children, and many of them with person and clothing so unclean that scrub brush and soap, aided by "musk," "rose geranium," "oil of roses," or "cashmere bouquet" would fail to exterminate the original smell, think you not that the ventilation should be of the best? More people are hurt by bad ventilation than by too little heat. By bad ventilation the blood is not sufficiently aerated in the lungs, making more artificial heat apparently desirable, and, conversely, as pure air is made available, the temperature rises and we are kept warm with much less need of outside combustion. It is astonishing how people may become so accustomed to breathing impure air as not to recognize its presence and superabundance. It must be remembered that the senses are not affected by impure air as they are by falling temperature, and therein lies the danger.

Is there not an abundance of pure air at our door? Is it not wholesome? It its appropriation sinful or forbidden? Is it difficult to obtain or expensive? There is but one answer to all these questions. God's providence presents but the one means for aeration and purification of the blood and the removal of effluvia. To live we must utilize the means, and in the building of our school-houses we must have it arranged so as to admit an abundance of pure air, and also to carry off the impure air. The air by our breathing loses its vitality. First, by being robbed of its oxygen, and secondly by being charged with carbonic acid and other impurities.

We find in the air, by original condition, about four parts of carbonic acid gas to every 10,000 parts of air. To say the least, it is not safe for us to breathe air charged with more than double this amount, and seven parts of carbonic acid is bad enough. The quantity of this gas is 100 times greater in breathed air than in the atmosphere. In five hours time the breathing of one person will add the additional three parts of carbonic acid to the four parts already existing in the atmosphere and thus vitiate 10,000 cubic feet of air. It will be perceived that this is four or five times the cubic space of an average sized living room. It is not uncommon to find in homes, churches and school rooms, and in sleeping rooms from 15 to 20 and more parts of CO_2 in every 10,000 parts of air, and the occupants are entirely unconscious of the existing danger. People would consider themselves defiled if their hands should touch the filth, effluvia and foul decomposing organic matter that, without stint or hesitancy, they daily drink into their lungs. As in five hours a person vitiates 10,000 cubic feet of air, it is apparent that means for the admission of pure air should be sufficient to supply each person in the room with 2,000 cubic feet per hour.

This introduction of pure air necessitates room being made for removal of a corresponding amount of air already within, and ventilation is the result. Think of the old fashioned fire place, the heating was unequal, and expensive, only about 12 per cent of the heat being utilized; but there were ventilation and health. A modern chimney will remove per hour five times the amount of air in an average sized room, which would be sufficient to

furnish 2,000 cubic feet of air per hour for every person occupying floor space 4x5 feet. An ordinary gas jet placed in a flue, will move 3,000 cubic feet per hour. Think, then, of the free, the full, and the capacious breathing of one of the grand old fire-places of which we early knew. Think how it roared and threw with a hurl the breathed air up and out the chimney. No wonder the back felt cold from the rush of air to the chimney; and how much we enjoyed the conscious breathing of the lungs. No wonder, also, consumption was then a thing comparatively unknown. Heating and ventilation go together. The most economical method of ventilation is certainly by use of the ascending currents produced by expansion from heat; and hence such method is called the natural method, which must appear as the correct method. To my mind there is no plan or method for warming the air of our houses and securing resultant ventilation comparable with that possible by the use of the properly constructed warm-air furnace. The old fireplace gave way to the stove for economic reasons. The air-tight stove has come to stay, yet provision must be made for removal of impure air. The chimney must be utilized, and this can be done by ventilating flues, so placed that the heat from the smoke flue will produce sufficient upward current to remove the air by connecting ducts and through registers in the floor in remote parts of the room. There should be provision for admittance of air from without, which should be where it can be immediately warmed, and preferably within the jacket of the stove. It obviously will require more surface and fuel to warm moving and changing air than that which is stagnant.

Persons out of rooms more or less of the time do not notice the effects of heating by stoves, but if occupied by them continually evil effects such as headache and other aches, from improper ventilation, etc., will be felt. Yet there is now coming to the front a very good form of heater combining the good feature of the stove and the open fire.

So much for the common and lesser means of heating and ventilation. There are the steam heaters, hot water circulation, and the furnace, or as it is more properly called, the air warmer. The first two mentioned are used nicely in hotels, factories and a certain class of buildings, but for general purposes they are not so good as a furnace, because ventilation and heating are separate, hence more expensive. Architects sometimes prefer the former on account of the economy of room, yet they are not as good for general use. By furnace I do not mean a stove placed in the basement and heated red-hot in order to warm the building, but a large iron furnace with avoirdupois enough to hold a constant temperature and a wind-pipe sufficiently capacious to keep the building comfortable in all its parts by a perfect flood of air moderately warmed and of normal condition. The furnace, if properly constructed, (1) takes its supply of air from without; (2) the air is warmed before it enters the room and consequently before it comes in contact with the person; (3) the temperature is even in different parts of the room; (4) the vital elements of the air are not removed by contact with overheated surfaces; (5) there is no waste of heat by conversion into mechanical energy (nine-tenths of the heat in the fuel is utilized, while in steam it is about three-fifths); (6) ventilation is self-acting, all impurities are alike removed. The best furnace in the world will not heat well without proper arrangements for handling and moving the air. The foul air should be removed at the floor and preferably at different parts of the room. Air tight ventilating

ducts, or space beneath the floor, should carry the impure air to the capacious ventilating shaft, where the otherwise waste heat of the smoke-stack is utilized in producing a powerful upward current that rapidly removes the air previously within the room, and invites the coming of pure air over the furnace and from without.

Such a system ventilates; not by the struggle of the furnace to force air into the room, but because of the powerful upward current in the ventilating shaft, which keeps constantly moving through the building a flood of life-supporting air, the same having passed over the furnace in entering the building. It is astonishing how much ignorance there is as to proper methods of ventilation, or even as to ventilation at all. There is practically no excuse for the foul condition of most of our churches, school-houses, and other public buildings. Experiments show that bodily sensations cannot be trusted to measure this form of energy that we call heat; it is an unsafe standard. Frequently a window or a door adds its dangerous draft and cools without purifying. How often teachers make a mistake in this direction. While one is suffering with cold another is suffering with heat. With care on the part of the teacher, and with good ventilation as I have described, no trouble need be experienced.

Here I wish to speak of a system now in use in the West Branch building called the "dry closet." It never has been my privilege before to know of its practical workings. The plan is this:

Fresh air from out of doors is supplied in such quantities as may be desired; this is heated by furnaces and passes through various flues into each school-room. The proportions of warm and cold air can be regulated to a nicety by the teacher, according to the requirements. After circulating through the room it passes out through grated openings which are placed at short intervals in the baseboards on the outer boundaries of the room. This warm air then passes under the floor, heating it sufficiently to warm the feet, and is carried to the foul-air room in the basement; thence it is drawn by way of arched openings in the brick wall through the closet vaults beneath the seats to the brick foul-air chimney, whence it escapes into the open air at the rate of 43,200 cubic feet per minute. The upward current in the foul-air chimney is created by the natural disposition of heated air to rise, and the draft thus produced in the stack is amply sufficient for the purpose. For use in summer a small heater is built in the walls at the base of the stack, and when the draft is not sufficiently strong without it (as perhaps on damp, muggy days), a fire may be quickly kindled here, and the hot air rising through the stack at once stimulates the draft to any required extent. The closets are built upon a platform raised three feet above the floor of the basement, furnished with seats and lids in the usual manner, and divided by wing partitions. No odor of any kind is distinguished when the seat or lid is raised, and the air-meter indicates a downward draft of 160 cubic feet per minute or thereabout if properly constructed. It seems to me that everything can be said for Smead's dry-closet system, and scarcely anything against it. There is no odor, no poisonous gases, and one great benefit is the fact that pupils will not be obliged to leave the school building in bad weather. Exposure by leaving warm rooms is certainly very injurious. Pupils as a general rule leave without sufficient clothing to protect them. The temperature of the closet and of the school-room ought to be the same.

So far as my knowledge extends, we have experienced no trouble by way of sickness or otherwise in its use. If there are any poisonous gases that are carried up the foul air duct, and thus into the atmosphere, they are so much diluted that it seems to me no evil effects can be experienced from it. The pupils of this school to which I refer are generally healthy and free from colds, and I think the people in the vicinity of the school building are equally as healthy. The poisonous gases have been sufficiently diluted so that it would be as healthful, perhaps more so, in the vicinity of the West Branch than in the vicinity of the other school buildings where these poisons instead of passing into the atmosphere work their way not only through the air but through the ground to the various wells, thus contaminating the water used for drinking purposes, thereby spreading the germs of disease.

I will pass over condition of floor and walls by saying that they should be kept scrupulously neat and clean. The floors should be frequently mopped to take up fine particles of dust that otherwise might be floating in the atmosphere.

As to position of pupils,—at all times teachers should see to it that pupils sit easily upright.

Under "Exercise" a great deal might be said. Have exercise, but of a proper kind, calisthenic exercises, or relief exercises of some kind during the sessions, especially with younger pupils. Do not make school sessions too long. I would have no general recesses, believing that it is injurious to health, happiness, morals and to intellectual development. Generally speaking I would have unrestricted individual recesses. I will give reasons for omitting general recesses by quoting from a paper given by Superintendent Howell, of the Lansing schools, before the sanitary convention at Lansing, in March, 1885.

(1). "Because they have always been in cold and stormy weather, a fruitful source of colds, with their attendant disorders, such as diphtheria, catarrh, pneumonia, etc."

(2.) "Because the liability to injury from accidental collisions during the rough and boisterous play always seen at recess would be greatly lessened."

(3.) "Because discipline would be simplified and good order promoted."

(4.) "Because the opportunities for moral contamination during school hours would be reduced to a minimum."

(5.) "Because family convenience would be greatly served." This is especially true in cities, also in villages.

(6.) "An unbroken school session tends to the concentration of thought and the formation of habits of study."

(7.) "Recent examinations of the eyes of school children in the public schools of many cities of the country go to show, say the physicians, that myopia among school children is nearly as prevalent in this country as in Germany, which outranks every other country in the world in the number of her near-sighted." Most of the work ought to be done in clear daylight, and by shortening the session the best part of the day for light is utilized.

At a meeting of the Pathological Society of Rochester, N. Y., a few years ago, after a full discussion of the no-recess plan, fifteen out of the twenty physicians present voted for no recess, three for recess in summer, two for general recess. No instances were mentioned where any physician had a patient from the no-recess plan. Prof. Z. C. Spencer, formerly of this

place, in speaking of this plan at Battle Creek, says: "It had been followed in all grades of our public schools for fourteen years. I have never heard or been informed of any complaint of the system from any source."

It is necessary, then, as citizens to guard carefully the public interests, especially that pertaining to the public health, not the least is the one relating to school hygiene. Let us have all the appliances that conduce to good health, and in the enjoyment of this let us not forget that it is air, pure air, upon which we must feed, remembering that it is one of the freest of all God's material blessings, and upon which there is no monopoly.

DISCUSSION.

After a vocal solo by Miss Dora Grayson, the discussion of the paper on "School Hygiene" was opened by Prof. Delos Fall, member of the State Board of Health, of Albion, who emphasized the necessity of looking carefully to the hygiene of schools, inasmuch as each individual spends on the average one-fourth of his entire life in school,—the primary, grammar and high school.

Prof. V. C. Vaughan, M. D., member of the State Board of Health, of Ann Arbor, stated his objections to the drying closets of Smead to be briefly as follows: (1) The continuous and uninterrupted flow of air in one direction in a school room is impossible. Doors must be opened and counter currents will be established. Such currents, even when they exist only momentarily, coming over dried fæcal matter, will be likely to convey minute particles with them. (2) By drying the fæcal matter in the building, any germs that may be present are placed in the most favorable condition possible for distribution through the air. (3) Germs are living organisms and you cannot dilute them, as has been proposed, any more than you can dilute a horse or a rose bush.

No one would want his children to attend a school if there should be the corpse of one dead from diphtheria in the cellar. No one should want his child to attend school when there is a room in the cellar filed with fæces, which are liable to be filled with the germs of typhoid fever or other diseases.

Dr. Vaughan said that he did not believe in the deterioration of the race. He had seen the armor of Henry IV, and the average boy sixteen years old could not get it on. There has been no deterioration physically, mentally or morally. He thought the people of Michigan tried to get the best possible school buildings and thought there was a constant improvement.

Fourth Session—Friday, June 7, at 2:30 P. M.

After music by the Tecumseh quartette club, the discussion of the subject of School Hygiene was continued.

DISCUSSION OF SCHOOL HYGIENE.

Dr. E. N. Palmer of Brooklyn spoke in opposition to the "no-recess" plan. He thought it was well settled that children from seven to twelve years of age could not study more than twenty minutes consecutively on any one subject. Children should have rest. Colds and coughs are frequently taken by wraps being left in cold halls as well as by recesses. All depends on the

teacher, and too much is left to him. We would not hire a man without investigating his work. Yet we seldom investigate our schools.

Rev. J. S. Joslin thought the question of recesses was related to the question of physical culture in schools. Where there is no provision for physical exercise the mind is injured by the dwarfing of the body. It was his experience that the school-houses in the county were in better condition than in other counties.

Dr. C. E. Begel, health officer, Holloway, Mich., said that his experience had been that the ventilation of our country school-houses was abominable. Great care was usually taken to retain all the heat, the rooms were overcrowded and children come home every night with the headache. Colds and coughs result,—due not so much to the cold as to the super-heated air.

Dr. L. G. North being called upon to explain the workings of the Smead system in Tecumseh, said that it was hardly proper to ask a man to be judge and advocate, yet he occupied such a position in relation to the Smead system. In Tecumseh there is no system of sewerage. The vault system is in use and it is a dangerous one, and on this account they had put in the Smead system. He did not think there was any danger of the contamination of the air by disease germs. The great mass of excreta becomes gas. He thought the diffusion of gases would render the dried excreta harmless.

Dr. J. F. Jenkins said that Dr. North's idea of the diffusion of gases condemned the system, because it is impossible to control the gases which are carried to other parts of the building. As long as there is a fecal odor in a building there is danger of the germs coming up.

A. W. Mills, member of the School Board, Tecumseh, thought the frequent changes of air in the room kept it pure.

Prof. V. C. Vaughan, M. D., member of the State Board of Health, answered the question how the air could become contaminated with germs by the Smead system. How are germs ever carried through the air? How do we get a contagious disease by going into a room where a contagious disease is if the germs are not carried through the air? You would not enter this room this afternoon if there were a case of small-pox here, because you would expect the germs from that patient to come through the air to you and infect you. When the excreta is dried as in this Smead system and the germs are carried in this condition up into the air, they are in just the condition to infect the surrounding community. These germs do not easily die; they will preserve their vitality and danger under certain conditions a hundred years, just as wheat buried in Herculaneum will grow today. As to this system of ventilation, if any school board wishes to pay two hundred dollars to get fresh air, he would not object, but there are just as good systems which are not patented. As to the system of disposing of execreta, it is a positive danger. It is unsafe to have fecal matter in a building occupied by your children. You wouldn't let your children in a room where scarlet fever is. Any change in the current, such as the opening of a door or window, is likely to change the current of foul air and send these germs back into the room. There is not so much objection to the Smead system of ventilation as to their system for the disposal of excreta. It is wrong to have a privy vault in a room where your children are. A much better system is the dry-earth system, separated from the school-house.

Prof. Delos Fall, member of the State Board of Health, Albion, called attention to the fact that those who favored the Smead system spoke mostly

of the part of it relating to ventilation, while the criticism of the system referred to that part of it which related to the disposal of excreta and which was dangerous because likely to communicate disease.

Henry B. Baker, M. D., Secretary of the State Board of Health, being called upon, stated that in Cleveland recently just that sickness had occurred which had been spoken of this afternoon, and the newspapers say that the system has been ordered out. The sickness occurred not among those in the school, but among people who live around the school building. There is no way to distribute these germs where they will be more likely to cause disease than to dry the excreta in the manner in which it is done by the Smead system.

Oscar B. Bills, of Tecumseh, said that the school board had sent to several places and no cheaper way of ventilation had been found.

Dr. Baker replied that in the first annual report of the Michigan State Board of Health there was a description of a much better system, and one which was not patented.

THE RELATION OF CESS-POOLS AND PRIVIES TO WELLS.

BY C. M. WOODWARD, M. D., TECUMSEH, MICH.

The subject assigned to me, "The relation of cess-pools and privies to wells," being one of considerable importance in its relation to the public health, it will be my province to show, as well as I may, the dangers that may be lurking in the well, and "The old oaken bucket, the iron-bound bucket, the moss-covered bucket which hangs in the well," and which has figured so long in song and story, but which has now, however, almost entirely given place to the more modern pump. But, be this as it may, the most important matter is the source from which the supply of water is drawn, and its quality as to purity and freedom from disease germs.

I have prepared two diagrams, one, showing a business block, the other, a residence block; exhibiting the relation of wells to cess-pools and privies, the distances between the same, varying from thirty-two feet to to sixty-four feet, and while perhaps the situation of these privies and cess-pools, in their relation to the wells from which the water-supply is drawn, is as nearly in accordance with sanitary laws, or good sanitation, as observed in many towns of the size of Tecumseh, still there is, no doubt, room for vast improvement in the way of good drainage and sewerage. At present, Tecumseh has no sewers and few cess-pools, the waste water and night-soil being either thrown into the privy vaults, on the surface of the ground, or carried short distances by drains which lose themselves in the underlying strata of gravel, over which the town is built. This custom is very prevalent all through the village, and has but few exceptions. The above system of drainage is the best the town affords. By a continuation of this system it cannot be many years before the water-supply will be seriously contaminated, and, unless some proper system of sewerage is adopted, the public health must suffer very materially from this source. Probably no fact has been more clearly proved than that the drinking water is often the source and origin of

Diagram.. Exhibiting the relative positions of Wells, Cesspools and Privy-vaults in a business block in Tecumseh, Michigan.

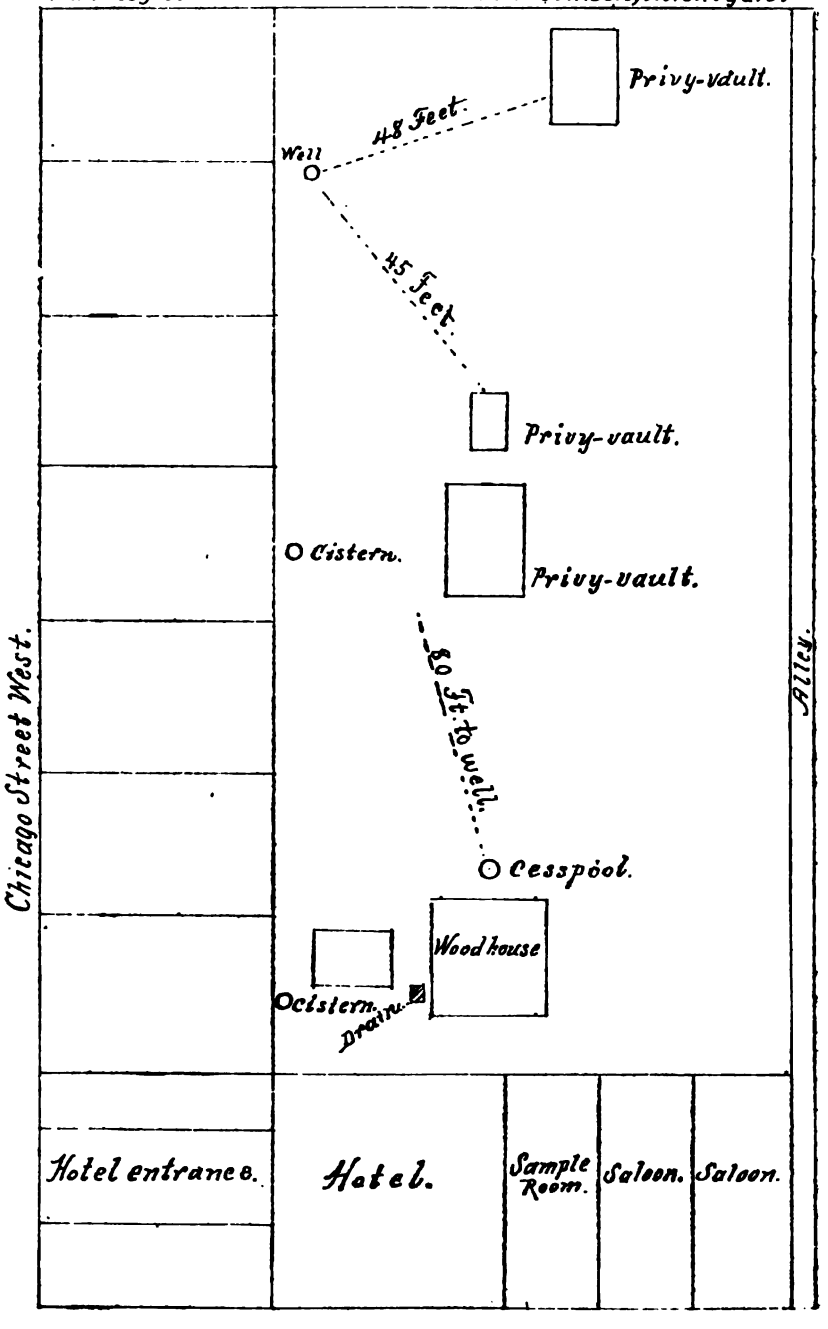
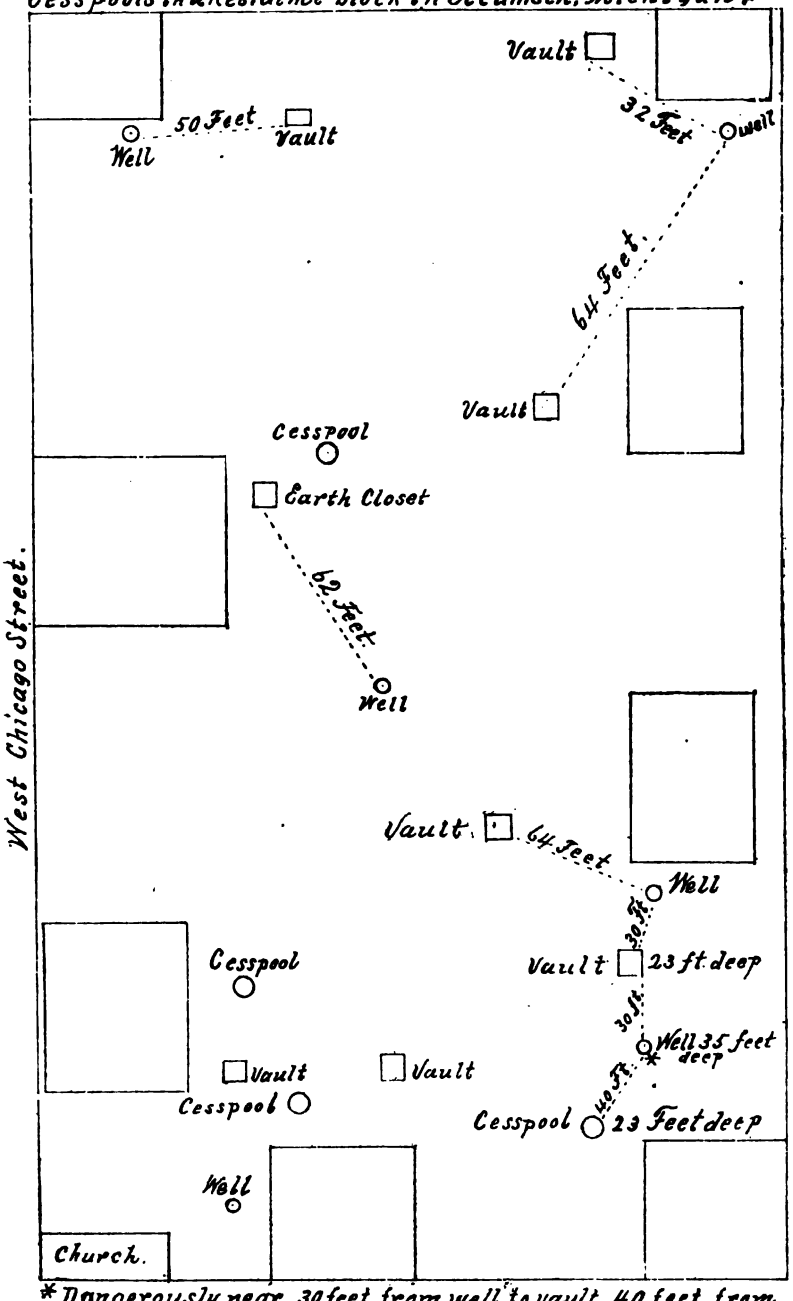


Diagram .. Exhibiting the relative positions of Wells, Vaults and Cesspools in a Residence block in Tecumseh, Michigan.



*Dangerously near, 30 feet from well to vault. 40 feet from well to cesspool.

many serious diseases, through its contamination by disease germs, notably those of typhoid fever and cholera and possibly those of dysenteric diseases.

These germs have been known to be carried long distances through the ground and make their appearance where least expected, with all the force and disease-producing power of which they were ever capable; for, while percolation through the soil may in some degree have the effect of purifying fluids, it cannot destroy the dangerous quality of disease germs, and does not procure immunity from the disease thus liable to be produced, for this filtration or percolation does not and cannot remove the chemical or organic salts, or living germs or organisms.

Now if privy vaults, or cess-pools, or drains are placed too closely to wells, there is danger of the contamination of the water therein, and yet it is not always the nearest vault or cess-pool that contaminates the well. It may be situated hundreds of feet distant (though generally the nearer the vault the greater the danger), and it is the same with the cess-pool. Much is owing to the character and direction of the drainage of the underlying strata of earth.

The common belief that the percolation of impure fluids through twenty-five or thirty feet of subsoil is sufficient to render it pure again is a very common and a very dangerous error, for when the soil becomes saturated with impurities from any source, it will not be long before the water underlying this source of contamination will be seriously affected thereby, and the alternate very dry and very wet weather constantly occurring promotes this process of soil saturation and possible contamination of water-supply with the poisons generated in these laboratories of filth. It may not be definitely known how long it would be before the soil would become saturated to a dangerous extent, but I am sure, were it not for the good natural drainage possessed by this fortunate village of Tecumseh, the health of our people would now be suffering sadly as a result of impure water, caused from the sources now under consideration. It has been ascertained that the soil underlying the village is composed of several strata—first the soil and subsoil of sandy or gravelly loam, then a coarser gravel, with a plentiful supply of cobble-stones; next, a substratum of clay, in some places blue clay, in others a thick, dense, yellow clay, from eight to fifteen feet thick, through which it would be difficult for surface water to find its way. This sub-stratum of clay has a gentle slope towards the river Raisin, over which the drainage and soakage from our cess-pools and privies finds its way slowly towards the river banks. Underlying this substratum of clay is the general water bed of gravel, which has free communication and which is filled with water from twenty-eight to thirty-five feet deep. This water bed is from twenty-five to thirty feet from the surface of the ground, according to location. Now, if only the driven wells were used in the village, but little danger of the contamination of the water would exist, but open, or walled wells, extending from twenty-five to thirty-five feet deep, are especially liable to contamination. These open, "dug" or walled wells, act as a tunnel or suction, drawing in the surface water and drainage for a considerable distance. It is perhaps well known, that an open well will at least drain an area of surface equal to its depth, hence it follows that if a well is thirty-five feet deep, and a privy vault or cess-pool is only thirty-two feet distant, the well has a fair chance to receive a good portion of the drainage from this source, and this will occur to some extent in the case of an open well, even if the vault or

cess-pool were two hundred feet away. Hence, the open well should give place to the driven wells exclusively, or else the privy vault should be abandoned and the dry-earth closet, carefully and properly managed, should take its place. But what can be done with the cess-pool to avoid the danger to the public health and the contamination of drinking water if the open well is continued in use? We should adopt a proper system of sewerage to carry off the fluid refuse and with it disease germs, to a proper outlet. The use exclusively of driven wells would protect our citizens from themselves as well, perhaps, as would be possible or necessary for the village of Tecumseh. But the "driven well" is not generally used. There are many open wells now in use in the village, and these must suffer materially from surface drainage. The wells in the eastern and northeastern portion of our village, from their location and the direction of the natural drainage, must suffer greater danger from soil saturation than those in the western and southwestern portions, or higher locations of the village. But owing to the nature of the source of our water-supply, if even one well is rendered impure it must in some degree endanger all the rest, be they driven or open wells, for the general water-supply is contaminated, and there is free communication and circulation between all the wells. Then it appears that the only way the citizen would be even approximately safe in his water-supply would be in the free dilution of the impurities or disease germs by this great bed of water. But this does not procure safety or immunity, for some disease germs act as vigorously from their quality as their quantity, and they are often active, even in attenuated doses.

It ought to require no argument to prove the objectionable features of the privy vault, or ground storage system, especially in a city fifty years or more old, and containing from 2,500 to 3,000 inhabitants. Indeed the privy vault and cess-pool wherever they may be situated are truly abominable, reeking with filth, and odorous from decomposing substances and gases. "The privy vault is an objectionable thing even in the country, with only perhaps six or eight families, of from twenty-five to forty persons, to the square mile of territory." How much more objectionable, then, it becomes when 2,000 or 3,000 people occupy even less than this amount of space, all depositing the waste of their bodies in the soil, often in close proximity to the well. The vault is often, also, made the receptacle of much of the refuse from the kitchen in the way of decaying fruits, vegetables and decomposing scraps of meat, slops and greasy dish-water—all to fester and decompose and saturate the soil from which we draw our water-supply; and we drink water, sometimes, that even brutes would not drink, if they knew what they were drinking? Is this an agreeable picture to you who pride yourselves on your cleanliness and abhorence of dirt and filth? You who would shrink with horror from exposing yourselves or your loved ones to the risk of contagion and disease, but who voluntarily expose yourselves to this even greater danger from a virulent poison. I repeat it as a fact, that there can be no absolute safety so long as privy vaults, cess-pools and open wells are continued in use—we are unable to protect ourselves against ourselves. The ordinary privy vault should give place to the well-regulated dry-earth closet, or to a systematic sewerage with sufficient water-supply to flush the mains frequently.

These are some of the dangers to which we are exposed, and the means which may be employed to avoid them. The fact that we have for so long

a time been spared from the direct results of soil saturation and contamination, is no surety that we shall in future be so fortunate.

If a Military camp of 1,000 men occupy an area equal to two squares or blocks in our city, without the greatest care being given to the condition of the "sinks" or privy vaults and cess-pools, in five days the water would become so impure as to endanger the health of the command, provided the water is obtained, as is often the case, in close proximity to the camp, and the danger is in nearly the same ratio in a city of not more than ten times the amount of area occupied by about 3,000 inhabitants. At this rate at the end of six months or a year, the city would become as impure and disease producing, as the camp at the end of five days and when we come to add the accumulated filth of forty or fifty years, the dangers are increased to an extent that demands the careful, thoughtful attention of every person, and the employment of the best sanitary skill, to avert the dangers that are constantly accumulating, and which may some day in the near future cost us the life of some dear friend, "who may yet be sleeping under the daisies" as a result of our thoughtlessness and inattention to these important matters.

GERM DISEASES.

BY J. F. JENKINS, M. D., OF TECUMSEH.

Among civilized nations, at various periods of the history of the world, it has been an interesting question with men who have made the subject of disease a study, in what way diseases originate. It is not necessary that I should even sketch the various theories relative to the causation of disease which have attracted the attention of medical men at different epochs in ancient and modern times.

Within the past thirty years the germ theory of disease has been a subject for investigation by scientific men, both in Europe and America. It may be well to state that the word germ is derived from the Latin word germen, which signifies the bud of the young twig, or that from which everything springs, and when we speak of germ cells we mean the entire germinal matter, a nucleus, or kernel.

Scientific men have already demonstrated by the aid of the microscope that a large proportion of diseases to which humanity is subjected have their origin in germs. Before proceeding further, it is necessary to state a few well established facts, viz., that the air we breath, the water we drink, and even the food which we consume contain germs so minute that they can only be observed through microscopes of the highest power. Many of these germs are harmless when taken into the human system; others we may term as poisonous, because they produce various forms of disease.

CONSUMPTION.

It has been computed that consumption, or tuberculosis, destroys about one-seventh of the human race. This disease is caused by a small germ (called tubercular bacillus) which is found in the sputum of persons having

this disease, and when the sputum is examined microscopically these germs are usually found in great numbers. They are also found in the lungs upon examination after death, and they are frequently observed in other organs of the body. These germs may be inoculated into the lower order of animals; for example, take the germs from the sputum of an individual having consumption or tuberculosis and inoculate them into a rabbit or a number of rabbits, and in the process of time a large proportion of these animals will die of tuberculosis or consumption. There may be some of these animals which will resist the disease, on the same principle that we may vaccinate a number of children with the same kind of vaccine virus, and in all the cases we may perform the operation with equal care and skill, yet, notwithstanding this fact, there may be several cases where it has not produced any effect. The same principle holds good in the inoculation of the germs producing consumption or tuberculosis.

This discovery was made by Dr. Koch, of Berlin, Germany, and verified by numerous observers both in Europe and America. The discovery establishes this fact, viz., that consumption is produced by germs, and that it is to a certain extent a contagious disease. The "pearly distemper" in cattle is the same as consumption in man, and the flesh of these animals when taken as food is liable to produce consumption or tuberculosis; the milk, also, is a source of infection. In the city of Berlin the flesh of all animals must undergo a thorough microscopical examination before it can be placed upon the market for sale, because many germ diseases may be produced in man, especially consumption, by consuming the flesh or drinking the milk of animals infected with this disease. It may be well to reiterate these facts, viz., that consumption or tuberculosis is produced by germs (called tubercular bacilli), and that in favorable soil—that is where the surroundings are unhealthy, or in a constitution favorable to their growth—they multiply and produce the disease; hence it is contagious.

Consumption is also a preventable disease, and on this question allow me to read an extract signed by the president of police of the city of Berlin: "On the ground of public health, it is directed by the President of the Police Board that the following regulations shall in future always be enforced in private institutions, insane asylums (as among the insane tuberculosis is frequently observed), and by practitioners to whose care consumptives are committed.

"1. Unquestionably consumptives are to be isolated, as far as possible, from patients suffering from other diseases.

"2. All patients suffering from this disease, as well as those in whom the disease is suspected, are hereby required to expectorate into spit-cups containing a small quantity of water. These vessels are to be washed out with boiling water at least once a day, and their contents to be emptied into the drain. Any soiling of the floors, walls, beds, etc., should be immediately cleansed with boiling water, or by other equally effective measures. Soiled clothing and bedding should also be boiled.

"3. Beds, mattresses, quilts, etc., as well as all other utensils and furniture used by the patients, must be disinfected in accordance with the police regulations of February 7, 1887, regarding contagious diseases. Articles that cannot be disinfected by boiling must be brought to the city disinfecting institute and there undergo thorough disinfection.

"4. The rooms occupied by consumptives must, after their death, be dis-

infected in accordance with the regulations referred to in the preceding paragraph."

CHOLERA.

All epidemics of cholera have their origin in the province of Bengal, India, and from thence spread over western Asia and Europe, usually following the line of commerce until they arrive on this continent. Nothing excepting war is more feared among a people than cholera, and until within the last few years little was known as to the cause and propagation of the disease. Dr. Koch was sent out in 1883 by the German government in charge of a scientific expedition, and visited India and Egypt in order to investigate the disease. He found a germ which he called the comma bacillus inhabiting the intestinal canal, and this no doubt is the poisonous agent which produces cholera. These germ are constantly found in the intestinal canal and its contents. They therefore very readily find their way into the external world. They continue their growth upon soiled clothes, or in impure water, which contain sufficient organic matter, or in various kinds of food and fruits, as well as in the moistened soil. The germs of cholera are swallowed, and, if not destroyed in the stomach, find their way into the intestinal canal, and there grow and multiply, producing an attack of cholera. Several experimenters have succeeded in producing the cholera in guinea pigs by introducing the cholera germ into the intestinal canal of these animals. The germ of cholera may be carried from town to town, from city to city, over the broad ocean, and along navigable rivers, wherever a ship or any other means of conveyance may be permitted to land her cargo, poisoned by the germ of cholera. The discovery of the cholera germ has already led to important results. It confined the last epidemic principally to Italy and Spain, by establishing strict quarantine laws against the infected countries, so that the disease was prevented from spreading over the great commercial countries of England and Germany. It was also the means of preventing the disease from landing on our shores. An infected ship, with a few suspected cases of cholera on board, was quarantined in the vicinity of New York harbor. The disease was accurately made out, or diagnosed, by means of the microscope. The cholera germs were found in the contents of the intestinal canal. By disinfecting the ship and effectually isolating all on board, the city was saved from an epidemic of cholera, and her commercial prosperity remained uninjured.

TYPHOID FEVER.

This disease prevails in almost every country. Within the last few years observers have discovered a germ which is present in all cases where a microscopical examination has been made. It is the general opinion that epidemics of typhoid fever originate from the water being polluted by the germs of typhoid fever. In the town of Plymouth, Pennsylvania, containing a population of eight thousand inhabitants, a severe outbreak of typhoid fever prevailed in the spring of 1885. Twelve hundred persons suffered from the disease, and there were one hundred and thirty deaths. The original case came from Philadelphia, and was stricken with the fever a short time after his arrival in Plymouth. It was evident after a thorough examination that the water-supply was polluted by the dejections from this single case. It was also

observed that those who derived their water from other sources were spared the disease.

Dr Vaughan, of the University of Michigan, will inform you that he discovered the germs of typhoid fever in the water-supply which was sent to him for examination from the village of Iron Mountain, in this State, where a severe epidemic of typhoid fever prevailed only a short time ago. Water and even milk contaminated with the germs of typhoid fever will almost invariably produce the disease in individuals who drink the poisoned milk or water. Hence whole communities have suffered sickness and death by drinking water polluted by the germs of typhoid fever. The typhoid fever bacilli or germs find the intestinal canal the gate of entrance into the human system. It is evident from this view, that all outbreaks of typhoid fever originate from the importation of disease germs, and in all epidemics we must seek the source of the preceding case. It may be safely stated that it is less difficult to destroy the germs of typhoid fever by boiling suspected water before it is taken into the system, than after they have entered the stomach and intestinal canal.

Whenever a case of typhoid fever occurs in a community, it becomes necessary to use every sanitary measure for the destruction of the fever germs, and by so doing avoid an epidemic of the disease.

It is impossible for me even to outline the whole field of germ diseases. The diseases already mentioned, viz: tuberculosis or consumption, cholera and typhoid fever are germ diseases which have already been fairly investigated and have opened the field for further investigations. In this field of thought, we are only at the very threshold of discovery, but we may be certain that we are surrounded by invisible foes in the form of germs, which may be frequently avoided by gaining a knowledge of their origin, and how they behave in the human system.

So far as our knowledge extends, relative to germ diseases, it is evident that more will be accomplished by proper sanitary measures, in controlling and preventing them, than can be done by medicinal agents, no matter how skillfully they may be administered, for the cure of these diseases, which have their origin in germs.

DISCUSSION.

The discussion of this paper was opened by A. Arnold Clark, of Lansing, who spoke of the rapid multiplication of these germs, how they produced disease in the human body, and how they might be destroyed. He emphasized the necessity of boiling all drinking water to destroy the germs of typhoid fever, and the necessity of disinfecting all rooms where cases of diphtheria and scarlet fever occurred, to destroy the germs of these diseases.

Prof. V. C. Vaughan, M. D., member of the State Board of Health, then spoke of the money loss from sickness, and the importance from mere financial considerations of destroying the germs of disease, and of protecting water-supplies.

DISPOSAL OF WASTE AND EXCRETA.

BY O. Q. JONES, M. D., TECUMSEH.

Nothing has ever perplexed the minds of sanitary scientists more than how to effectually dispose of the waste and excreta which are so constantly and abundantly accumulating. In the first place I will say in as few words

as possible that no swill-eating animals should be allowed to be kept within the limits of the village corporation. All swill should be securely kept in tubs and picked up by the scavenger or people who may call for it and fed to animals outside of the village limits. Soap-suds and dish-water should all be disposed of by pouring into small sewers which lead from the kitchen into large sewers to be carried far out beyond any possible danger; and no slops of any kind should ever be thrown upon the ground around the kitchen door or about the premises, whether or not it may be near a well or cistern of water, for the earth may become saturated to the depth of eighty or one hundred feet and contaminate the water of said well or cistern.

Potatoe, turnip and all other moist parings and substances should be deposited in a basket kept for that purpose, sitting in the wood house where they may dry out, and, then, together with moldy bread, cake, pies, crumbs from the table and pieces of meat, etc., should be cremated in the kitchen stove or a building erected for that purpose, outside of the village limits.

Litter from the stable should be kept under cover that it may be protected from drainage as far as possible and should be often removed to the open fields and plowed under by the tiller of the soil.

Cess-pools of every kind and nature should be abated whenever and wherever found.

Privy vaults should be abated and the most approved dry-earth closet should be substituted.

DISCUSSION.

This paper was briefly discussed by Dr. L. M. Jones, of Brooklyn.

THE RELATION OF CLIMATIC CONDITIONS TO DISEASE.

BY L. G. NORTH M. D., TECUMSEH.

The wording of the title of this paper does not imply that climatic conditions stand in a causal relation to disease. The failure to imply such relation was intentional. It is hoped that in this way an important fact may be emphasized. The fact you are asked to remember is this: climatic conditions often cause disease, but all diseases, no matter what their cause, are more or less influenced by climatic conditions. The point may be made plain by a moment's consideration of the two diseases, sunstroke and tuberculosis. In the former the excessive heat so acts upon the nervous system, particularly the brain, that congestion and inflammation result and we have sunstroke. In tuberculosis we have a disease that no climatic condition can cause, but when the seeds of that affection are once sown in the system, then climatic conditions so influence their development as, in one case, to occasion a speedy death, or in another to bring about recovery. In sun-stroke, climatic conditions are causative, in tuberculosis they are modificative.

Climatic conditions modify diseases in two ways, viz.: directly and indirectly. To illustrate this a few facts about cholera infantum may be adduced. The heat of summer acts directly in increasing the congestion and inflammation of the stomach and intestine. At the same time, the same cause may

be at work indirectly, continuing the disease, by favoring the fermentation of the baby's food, that produces in it the cheese poison—tyrotoxicon. The disease is not caused by the hot weather directly, but the heat does cause the formation of the poison tyrotoxicon, and it in its turn produces the cholera infantum.

It may be argued by some that climatic conditions can not be changed, that heat and cold, that sunshine and storm, are not within man's control, and that in consequence a knowledge of their influence on disease will not enable us to better our condition. Such argument is sophistical. The man on the railroad track can not stop the locomotive, but if he is not a paralytic or a fool he will get off of the track. So the man, whose baby has cholera infantum cannot change the summer into fall, but he can stop giving the child the poison that is making it sick. Illustrations of our ability to prevent the ill effects of climatic conditions, though we can not change the conditions themselves, could be multiplied indefinitely. An umbrella will usually prevent sun-stroke. A well ventilated room will usually prevent the congestion and inflammation that belong to many of the stomach and bowel complaints of the summer months. Perfect cleanliness of the utensils, etc., will prevent the peculiar fermentation that generates tyrotoxicon, the undoubted cause of most cases of cholera infantum.

Your attention is invited for a few moments to the following conditions of climate that are believed to influence our diseases.

1. Temperature.
2. Sunshine.
3. Atmospheric moisture.

I. TEMPERATURE.

We know little of the absolute extremes of heat. How cold a piece of iron would be which had in it absolutely no heat we do not know, and we are equally ignorant of what intensity of heat is within the resources of nature. Between the extremes of which we are cognizant are some three or four thousand degrees Fahrenheit. Compared with these extremes, the extremes within which life is possible seem small indeed, for the freezing point on one hand (generally speaking) and the boiling point on the other, mark the bounds beyond which life can not go. Within this narrow limit is a still narrower one of less than 20 degrees, within which the human body must be kept or man dies. Fortunately our bodies have power of maintaining a proper degree of heat when the surrounding atmosphere is a little above or considerably below the temperature that is necessary to their existence. Such maintenance, however, is a draft on one's vitality. The winter exposures are especially dangerous to aged persons. It may be laid down as a rule that diseases of the lungs and air-passages belong to the cold months, the rule applying especially to inflammatory affections of those structures. This is not strange when we remember how the respiratory organs are, in cold weather, exposed to the air that is from 75 to 100 degrees below the temperature of the body. The skin on the hands and face is thick and tough but in cold weather it has often to be protected from the intense cold. Yet the same air that it can not endure, has to be endured by the skin lining the respiratory tracts, though they are so delicate that in comparison with them, tissue paper is coarse and thick. If the amount of necessary air was two or three times as great, or if the air channel to the lung was short and straight, it is prob-

able that man could not inhabit this climate. It is the opinion of the writer, that nature designed man for a milder clime than this, or he would have been better protected from the cold than he is with a hairless skin. If we are where nature designed us to be, is it not strange that our hands and feet can not be accustomed to our climate, so as to not need protection in ordinary winter weather?

There is another way in which cold interferes with our health and makes our diseases worse. It is an indirect cause of ill-health, but it is none the less real. I refer to crowding and imperfect and inadequate ventilation. In our climate and with our civilization, existence without artificial heat is impossible. But fuel costs money and strenuous efforts are made to economize. Hence the house is built as tightly as possible, the walls and ceilings are papered, and the floor is first covered with paper and then with a carpet. It would seem as if that would be enough, but it is not. A coal stove is then put in the room. It will give out the most heat, and do the least toward ventilation of any contrivance that can be found. All this is not quite enough, so rubber weather strips are applied to the doors and windows. and then, with the use of a few large kerosene lamps to give off a plentiful supply of poison, the family is prepared to keep warm and at the same time breathe air that is all that the angel of death himself could desire. This is no fancy picture, but the actual condition of many houses. Warm, pure air in winter costs money, and if anything is worth more than wholesome air I have failed to hear of it. The direct result of long continued breathing of such air as is found in badly ventilated houses is not well understood, but even if we could not put our finger on some particular disease and say this is the result of bad air, we know that the system is weakened by such unwholesome conditions, and that such people when attacked by any disease are more apt to succumb than those whose surroundings are good.

If it takes strength to maintain our body heat at the temperature of ninety-eight and one-half degrees, ought not an atmosphere of that warmth to be the most healthful of any? It might seem so at first thought, but we know that such is not the case. I am not aware that any one has attempted to say what temperature is the happy medium. It is probably somewhere in the sixties.* Why the best atmospheric temperature is something over thirty degrees below the essential heat of the body cannot be fully answered in this paper. Two important reasons only will be given: The manifold chemical changes that are constantly going on in the body and which are essential to life, are similar to combustion and, like that process, give out heat. If, then, the atmosphere was as warm as the body needed to be, there would be too much heat and strength would be consumed in getting rid of the surplus. The other reason to which your attention is called is this: When the temperature of the air is nearly the same as that of the body, animal and vegetable life, especially the lower forms, becomes very active. Many of these lower forms of life are man's mortal enemies. They are mostly microscopic in size, but are none the less dangerous on that account. They seek entrance to our bodies in the air we breathe, with the food we eat, in the water we drink, and at every point where the skin or mucous membrane is broken. Which one of these avenues needs to be most closely guarded it is hard to say, for the germs of death are liable to enter at any one of them

*[The Reports of the Michigan State Board of Health show that, in Michigan, June is the most healthful month, and that the average temperature of the atmosphere in June is about 65° F.—*H. B. B., Sec. State Board of Health.*]

at any moment. The summer, therefore, as well as the winter, has certain classes of diseases that are common to it. From what has been already stated it would seem as if those germ diseases which multiply outside the body would be most numerous in summer, and such is the fact. The warm season is the season for such germ diseases. It should be said, however, that the germ theory is as yet indisputably proved in only a few diseases. It is almost certain that malarial diseases, and intestinal diseases, are due to germs, and they also are affections of the summer months.

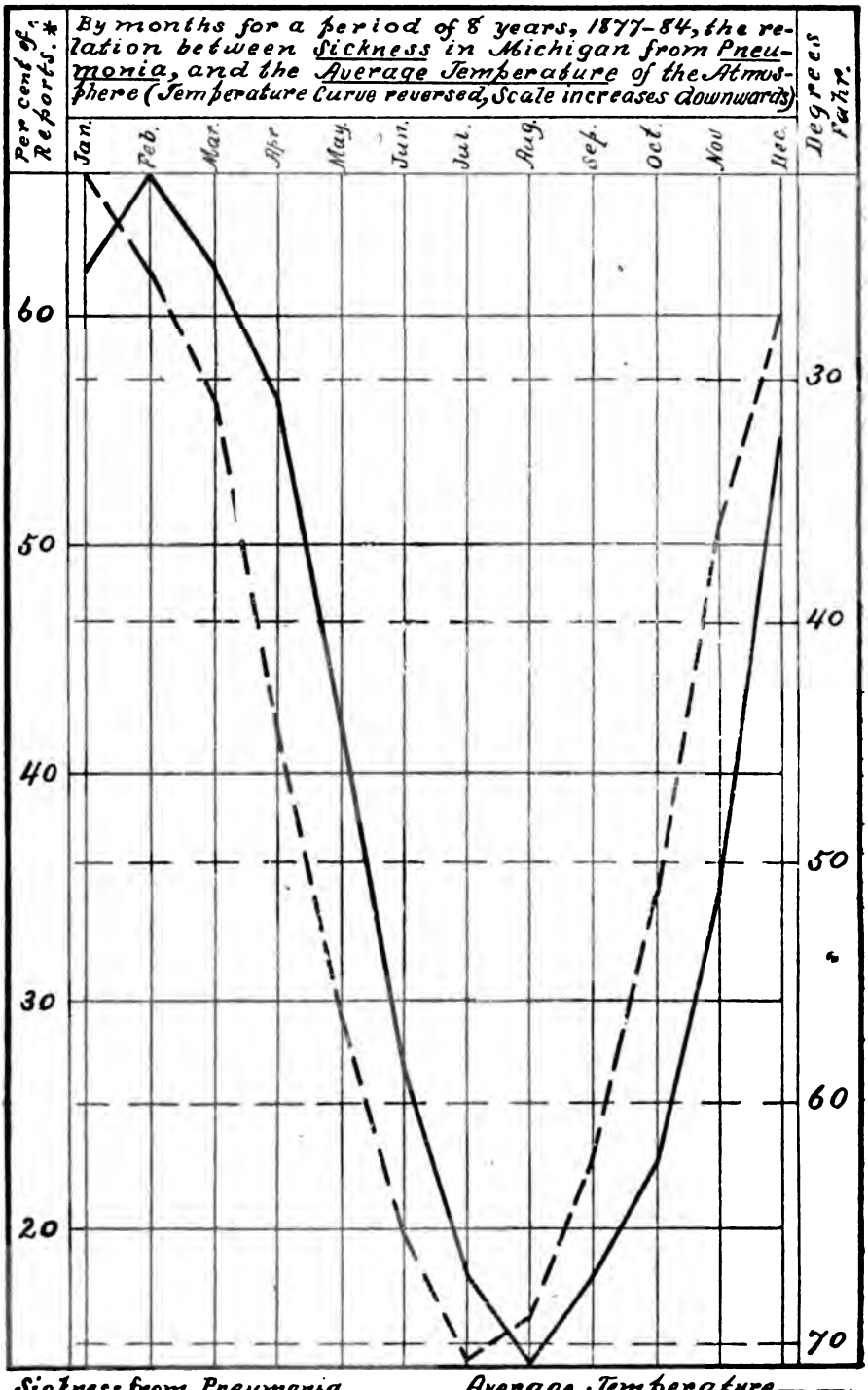
These statements I have made to you in a general way. I will now show you that in their elucidation much work has been done, and that they are capable of demonstration to almost mathematical accuracy.

[The speaker here explained the three following diagrams, which show that sickness from pneumonia, influenza and bronchitis in Michigan are governed by the temperature, these diseases rising as the temperature falls and falling as the temperature rises.]

II. SUNSHINE.

Everybody knows that vegetable life to thrive must have an abundance of sunshine, but few seem to think it is needed by the human plant. It is as important to the plant as is breath to the animal. It has been claimed that the difference between the cheery Frenchman and surly John Bull is due to the difference between the sunny climate of Paris and the smokey, foggy atmosphere of London. This may be carrying it too far, but there is a germ of truth in it I believe. The universe, as we know it, consists of matter and force. Practically all the matter with which we have any dealing comes from the earth, and all the force comes directly or indirectly from the sun. If the earth is our mother the sun is our father. The latter is just as essential to our existence as the former. The first source of all life and motion comes down to the earth in the rays of sunlight, and those rays so beneficial,—so essential to the plant are health giving to man. By this I do not simply mean, that in a general way sunlight is a good thing. To get its benefits we need to get out into it. We need to get out where the direct rays can reach us, to ride, to work, to walk, to be within reach of its vivifying power. We need to bathe in it, to bathe often and long, to get its force till we are tanned. My mother was a firm believer in tanning when I was a boy, and showed her faith by her works. I now believe in tanning as firmly as ever she did, but it is of a different kind. I think I know that the man or woman who is in perfect health has tan, on hand, and cheek, and brow. I grant you that such a woman would not fill the popular idea of beauty, but it is health we are talking about, not looks. There was recently opened in Washington, D. C., by Prof. Wm. A. Hammond, one of the leading physicians of this country, a sanitarium for the treatment of diseases of the nervous system. The institution is supposed to be as perfect as it is possible to make it. In his announcement he specially mentions the fact that it contains a solarium for giving sun baths. This is mentioned to show that this leading physician has faith in the direct rays of the sun. You are recommended to take sun baths. You need not go to Washington to get them for they are to be had anywhere, everywhere, without money and without price. Take them. Take them freely, but in the taking use the reason the creator has given you, using not abusing a blessed source of joy and health.

NO. 1.—TEMPERATURE AND SICKNESS FROM PNEUMONIA IN MICHIGAN.

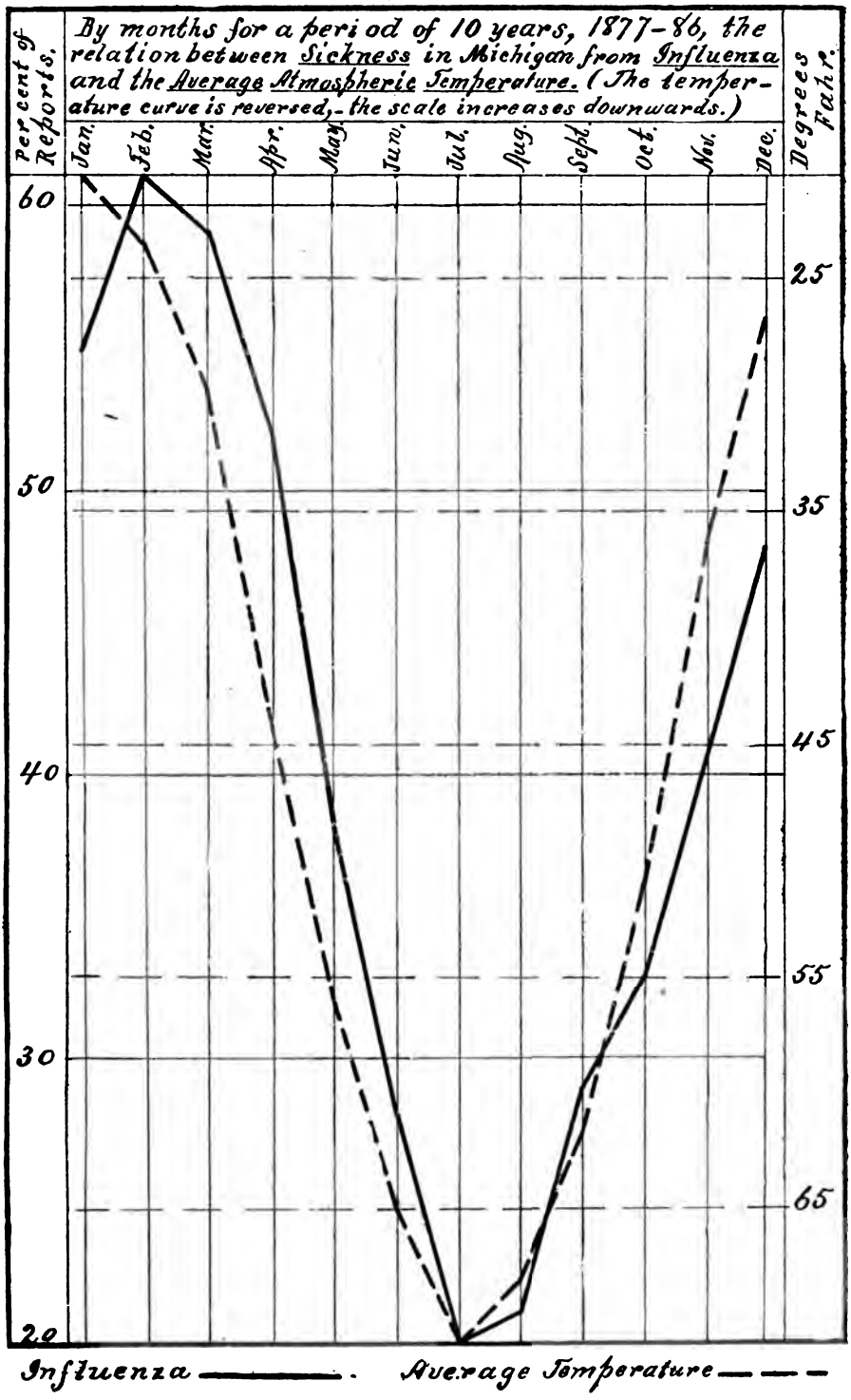


Sickness from Pneumonia _____. Average Temperature — —.

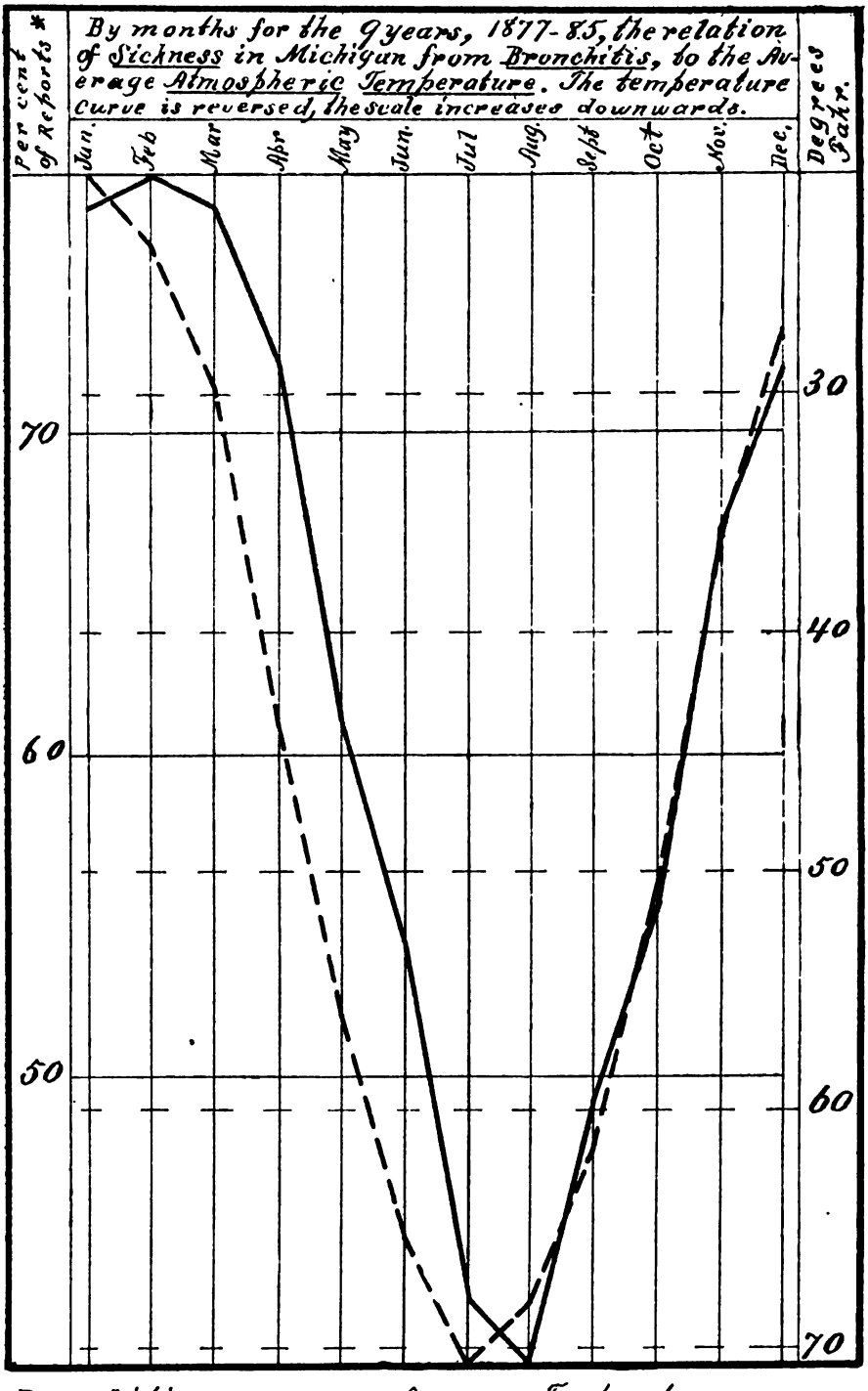
*Indicating what per cent of all reports received, stated the presence of pneumonia then under the observation of the physicians reporting.

Over 30,000 weekly reports of sickness, and over 150,000 observations of the atmospheric temperature are entered

NO. 2.—TEMPERATURE AND SICKNESS FROM INFLUENZA IN MICHIGAN.



NO. 3.—TEMPERATURE AND SICKNESS FROM BRONCHITIS IN MICHIGAN.



Bronchitis ———. Average Temperature — — —.

* Indicating what per cent of all reports received, stated the presence of Bronchitis then under the observation of the physicians reporting.

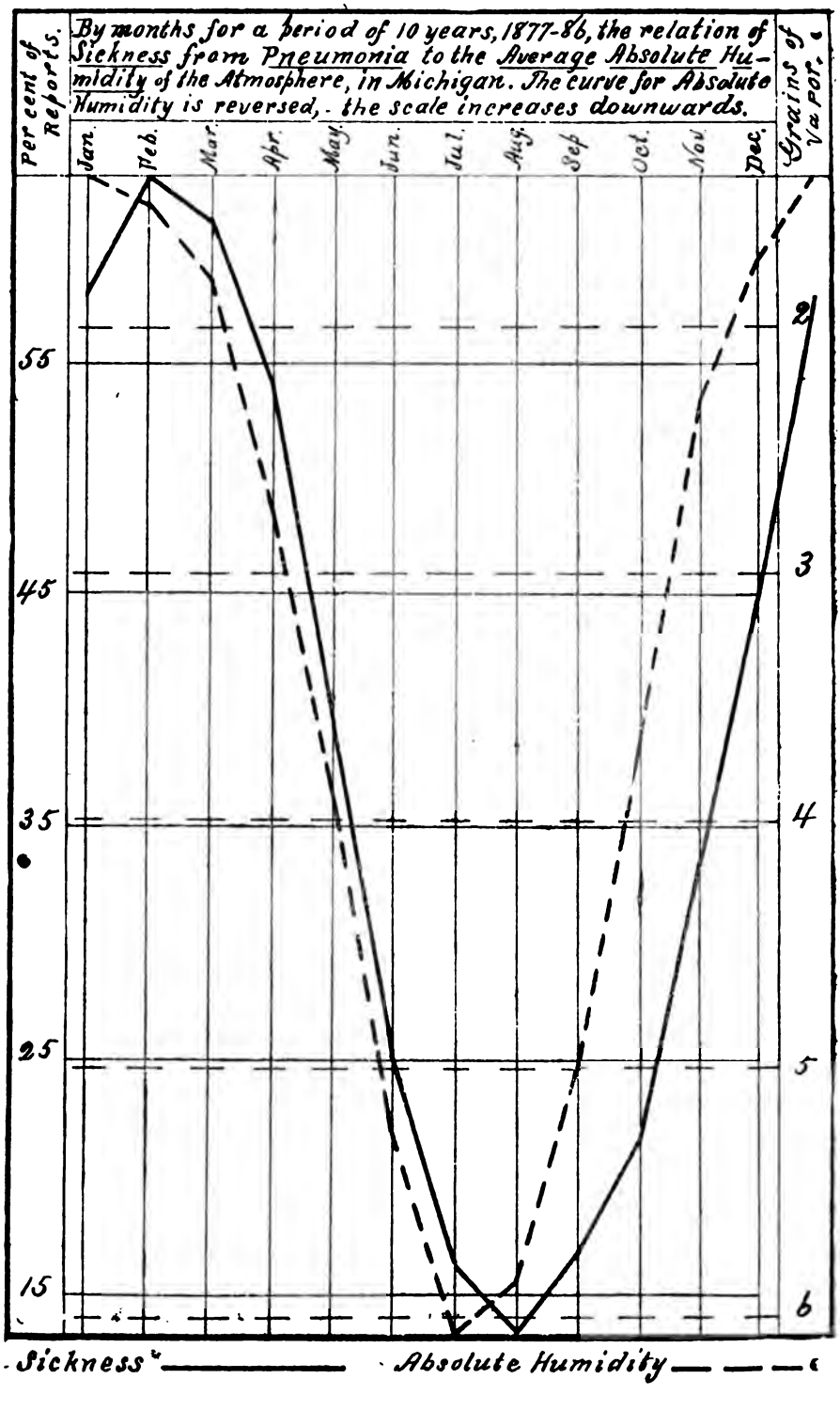
Over 35,000 weekly reports of sickness, and about 173,000 observations of the atmospheric temperature are represented in

III. ATMOSPHERIC MOISTURE.

A consideration of this part of my subject could be easily made to consume more time than is allowable for the whole subject. It can be little more than glanced at as what I have already written will consume most of my time in its reading. Briefly then we may say that all atmospheric air contains water, the quantity of which varies much under different circumstances. Barometric pressure, the direction of the wind, electrical conditions, and probably other conditions not yet known, have an influence in determining the amount of water in the air, but by far the most important factor in determining the moisture of the atmosphere is its temperature. Warm air will carry much moisture, cold air but little. There is a proportion proper to cold weather, to moderate weather, and to warm weather. When in warm weather the air is too dry we feel it in the eyes, in our throats and the skin itself becomes harsh and is more liable to disease. When in warm weather the air is too moist it causes suffering and danger in another way. In such weather the temperature of the body is prevented from rising too high by the evaporation of the perspiration which accumulates on the skin, but if the air already has all or nearly all the water it can carry it will not take more and the evaporation, designed to cool the body, does not take place. When the air is in this condition we say it is muggy and such weather is notoriously uncomfortable. The condition is also dangerous and would often be disasterous did not our bodies become so uncomfortable as to cause us to discontinue exertion. The result of failing to heed nature's warning is a condition of great danger much resembling sun-stroke. When the atmosphere is near the freezing point and is unduly wet we have another most uncomfortable and dangerous condition. It is very common when the snow is thawing in the spring, the water of the air being cold and being brought near the body abstracts heat rapidly and chilling is the result. Hence we often suffer from cold when the temperature is above the freezing point and the next day perhaps feel no discomfort with the thermometer many degrees lower. Therefore the day when the snow goes off is a dangerous one to many. It is the day of danger to the writer for he almost invariably takes cold. He recognized the fact long before he knew the explanation.

In severe winter weather the air is from necessity always dry. Such air if warmed is still dry and will absorb moisture greedily from any source within reach. Hence the air in our homes in winter is generally too dry and is improved by having a dish of water on the stove or in the furnace. Furniture, doors, casings, etc., shrink more in winter than in summer not because they are kept warmer but because they are kept dryer. The same principle holds true in the mouth, nasal passages, throat, bronchial tubes and in the lungs. The air comes to them cold and dry. The heat of the body warms it and it abstracts water from the mucous surfaces over which it passes. This fact explains the great prevalence of catarrh, throat disease, bronchitis, and pneumonia, in our lattitude and climate. The dryness of our winter air stands in a causative relation to most of them or all of them probably. In support of this statement I wish to call your attention to another diagram.

NO. 4.—ABSOLUTE ATMOSPHERIC HUMIDITY, AND SICKNESS FROM PNEUMONIA.



As the reading of what I have already written will consume all the time allotted to this paper I will write no more, but will simply say that besides the atmospheric conditions which I have spoken of, others have important influences on disease. Atmospheric pressure, winds, ozone, electricity, and probably others belong to this subject. They will likely be brought out in the discussions.

THE RELATIONS OF CLIMATIC CONDITIONS TO DISEASE.

DISCUSSION BY HENRY B. BAKER, M. D., SECRETARY, STATE BOARD OF HEALTH, LANSING, MICHIGAN.

First, I must express my pleasure in listening to the very interesting and instructive paper just read by Dr. North.

There cannot longer be doubt that some of our most common and fatal—therefore most dangerous—diseases have important relations to climatic conditions. Thanks to the philanthropic and public-spirited physicians in Michigan who, from their abundant experience, have contributed the facts in their reports to the State Board of Health, the statistics we have collected prove, beyond question, that, in some way, exposures in hot weather increase diseases of the bowels, and that exposure to the breathing of cold dry air increases diseases of the throat, the lungs and the air-passages, and also that large class of dangerous communicable diseases which usually enter the body by way of the air-passages, such diseases as small-pox, diphtheria and scarlet fever, and in my opinion, also, that most important of all diseases, consumption. The sooner these facts are appreciated and acted upon by the people generally, the better it will be for the public health; and the worse it will be for the doctors, unless the public hastens to employ and to pay the doctors for keeping people well as well as for caring for them when sick. I fear that the people of Tecumseh are not doing this to any great extent. From what I can learn, I believe that you are paying thousands and thousands of dollars to a number of physicians for necessary and excellent treatment after you are sick; but that you do not pay even hundreds of dollars to one physician for keeping you well. I sincerely hope that sometime you will reverse this condition of things. I hope one of the effects of this convention will be that you will pay your health officer at least a thousand dollars a year for his every day service for the prevention of disease in Tecumseh. And if you do, I believe he will soon earn all you pay him, and more. But the work of the health officer will not be confined to the climatic influences. His work should be mainly for the prevention of the contagious and otherwise communicable diseases. And it should deal with such subjects as the isolation and disinfection of all infected things. You will still need some person or persons to continue to study out, for the benefit of all of you, and to clearly set before you as has been done to-day by Dr. North, the relations which shall be found to exist between climatic conditions and disease. Dr. North probably will not claim that he has told you all he knows on this subject, and no doubt, from time to time, much more will be learned by those who shall study the subject most deeply, much that will be of immediate practical use for the saving of life and health in Tecumseh. This is one of the practical sugges-

tions which, it occurs to me, is a logical sequence to the facts set forth in Dr. North's paper. You might, not only, well afford to pay Dr. North for his present effort in this direction, but also make it for his money interest that he continue efforts in the same direction. And the same may be said of each of the other physicians and persons who have contributed to the success of this convention. You may well make it for their money interest that they continue in some sanitary work. Unless you do, it is not probable that they will continue; they are not millionaires, able to devote their valuable time to your service without fee or reward. They will gladly serve you, and, I trust, will be as glad to work for the prevention as for the cure of disease, if you choose to so employ and pay them.

In the brief time allotted to the opening of a discussion, I cannot hope to do more than to suggest a few thoughts which, from my standpoint, it seems likely may be of service to you if you continue to study the subject.

People sometimes say: "Of what use is it to know the relations of climatic conditions to disease—we cannot change or control these conditions?" I think this is a mistake. Even the wild geese know enough to utilize such information as this. Shall we sit down and not try to avoid dangers which even the silliest of birds have already devised and used means for avoiding? We may, at least, borrow their wisdom and devise methods of gaining a living in different sections of the country in different seasons of the year. But I have confidence that we may yet know more than the wild geese do—that we may be able to control the temperature and humidity of the air we breathe while we are in our own houses. And in this connection we may do well to consider two facts: 1. It is, frequently if not generally, the long-continued exposure to hot or cold air that causes the sickness. This is not the common belief, but I think it is the truth. 2. Most people are indoors a large part of the time, where, if we learn how, we can control the temperature and the other conditions of the atmosphere.

I think we will all do well if we continue the study of the interesting questions which have been presented to us in the valuable paper just read by Dr. North.

Fifth Session.—Friday, June 7, at 8 P. M.

The last session of the Convention was opened by music by the Tecumseh Quartette Club, after which W. A. Frost, M. D., of Tecumseh, read the following paper on "The Restriction and Prevention of the Communicable Diseases from the standpoint of the Local Board of Health."

THE RESTRICTION AND PREVENTION OF DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE LOCAL BOARD OF HEALTH, BY W. A. FROST, M. D., TECUMSEH.

It is not my purpose to enter into a lengthy discussion of the subject now before us, in the presentation of this paper, as much of the ground has already been covered by papers and discussions during previous sessions of this Convention.

There are other subjects of interest to which you will be privileged to listen during this closing session. I shall, therefore, cut this paper down as much as possible and give room for thoughts not so nearly akin to those previously presented to you.

Principle must be the foundation of all advancement in sanitary science as everywhere else. A principle which in the hearts of the people will govern their actions, and in the hearts of their representatives, the Boards of Health, will also govern them in their efforts to protect the public, and make them loyal to the important trust confided in them.

Too much cannot be expected of our local boards of health, if, mark you, they be properly supported by the people whom they serve. The successful work of the board depends very largely upon the hearty co-operation of every citizen. Without this, it must be very largely a failure.

Wise legislation and a speedy, judicious execution of the law will do much to bring about a proper sanitary condition in every community, but it will not do to rely on this alone, for how often are we brought face to face with the fact that the law is not speedily and judiciously executed. If the laws we now have were or could be fully and rigidly enforced, a different state of things would exist in many localities.

From what we have previously heard, it is evident that all are or should be deeply interested in so vital a question. It is not for the few faithful ones in this locality or that, but for all, be they rich or poor. Each one must feel a personal responsibility in a work of such vast importance. All must be from the very nature of things. It is quite possible all are not as well posted as they ought or might be. And it is hoped that, with the advantages afforded through the State Board of Health, the people may become more familiar with the means of protection against the invasion of dreaded diseases. This cannot be accomplished by the State board alone, nor by the local board of health; but with the united efforts of the State board, the local boards, and the people, we can conquer many of the foes of human happiness and prosperity.

The time has come when the willing display of a card designating the presence of a contagious disease will be a mark of intelligence, and no longer a disgrace and imposition as it has been looked upon by many. When disease has invaded our homes by carelessness of others, prompt notice should be given the local board of health, that they may take all the steps necessary to restrict the same. The first part of the subject pre-supposes the presence of a dangerous disease and one which may be communicated in some one of the channels through which the germs may be conveyed. The second pre-supposes the absence of diseases dependent upon a specific germ, and that the board of health is to forever prohibit these germs from swimming in our drinking water or floating in the air we breathe. By this we can see that the board of health has no light task to perform, for these little infinitesimals are as active in the darkest night as in the noonday sun.

As to the means the board have to restrict and prevent disease I shall say but little, save that the legislature should make it a criminal offense for one to knowingly travel when affected with a contagious disease.

Scientific men and well-informed persons are rapidly learning that a very minute substance or germ, in the human system, may become a great disturbing power.

Diphtheria, scarlet fever, measles, typhoid fever, small-pox and consump-

tion are the principal diseases with which our local board of health has to contend. Should it accidentally or otherwise happen that any of the diseases mentioned should find their way into our midst, it is the duty of the board of health to see that they are properly isolated and remain so until all danger of directly communicating the disease to others is past.

If the small-pox should make its appearance in your home or mine we must submit to the prompt removal of the patient to some place remote from the thickly-settled portions of our village if it is thought necessary in order to restrict the same; and all suggestions from the board of health should be fully carried out.

Then in summing up the whole subject, let us emphasize the necessity of education—first, last and all the time—concerning the many ways whereby these dangerous diseases are spread, and the best methods for their restriction and prevention.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE CLERGYMAN, BY REV. F. ADKINS, TECUMSEH, MICH.

It was a saying of John B. Gough that he knew that his stories were true, for he made them himself. I have better confirmation of my statements tonight, in that I have not only made them myself, but every other man who has addressed you has made the same. If you look at a landscape from various sides, you will not always expect to see new things at every observation; you will see the same things in different relations. And if from opposite sides you see the same things that you saw at first, you will be reassured of the correctness of the first view. If I shall show you from another standpoint the same facts to which your attention has already been called, and thus confirm their reality and importance, my mission here will be fulfilled.

In some minds it might be asked whether with reference to a question like this the clergyman has any standpoint at all. The fact that this is declared to be not a doctors' but a people's convention, would indeed justify admitting to this platform any one accustomed to address the people on matters of public interest. Still it might seem at first sight strangely out of place for one supposed to be concerned chiefly with things spiritual, to address even the people on a question of health in the presence of distinguished physicians and sanitarians. But there are laws of health, which are divine and immutable,—to discover and conform to which is the duty and the safety of man, so far at least as this life is concerned. There are also health laws promulgated by human legislators, and these ought to be in harmony with and in vindication of the divine laws of health. Both these systems of laws have a moral and spiritual bearing and significance. In fact in their moral aspect consists their chief importance and utility, as well as their authority. Questions of health, then, private or public, have not only a physical, a scientific and a legal, but a moral and religious significance. On this side such questions come plainly within the purview of the Christian

ministry. The standpoint of the clergyman is not merely one of intelligent observation, but one of responsible influence and action.

The province of the minister includes the exposition and enforcement of duty, and this in all spheres and relations of life. It is the province of the physician to study the forms of disease and to seek and apply the remedies; of the sanitarian to ascertain the laws of health, and the methods by which disease may be prevented or its ravages mitigated and restricted. It is the province of the minister to interpret the moral obligations revealed in these discoveries. The clergyman therefore looks upon sanitary science from two points of view. (1) His own personal relation; (2) the citizen's duty.

If I were addressing an assemblage of ministers, I would insist upon the clergyman's personal duty to the cause of public health, as he meets with disease and contagion and death in the course of his pastoral ministrations. I should speak of the methods of influence he may employ to aid in the prevention of disease and further the humane cause of sanitary reform, and here would be opened a wide and important field. But as I am addressing the people, and these discussions are to bear directly upon the people's relations and needs, I shall speak only of the citizen's duty in this respect, as it appears from the standpoint of Christian ethics, and is involved in the requirements of a Christian civilization.

Within the sphere of human conduct and motive there is no grander word than duty. It tunes the soul to richest harmonies; it is the vital principle of manliness and godliness. If duty implies restraint, the restraint is wholesome. If obligation means a binding, it is a binding to the car of life and liberty—it is an impulse to regal exaltation. No voice that reaches human ear is so fitted to awake the best energies of the soul, incite to heroic endeavor, and lead to grandest conquests, as the call to duty. Where it finds a clear response, the desert is made to blossom as the rose, the soul is girded with strength, and life is crowned with health and glory. In the last analysis the highest duty is the highest privilege and pleasure. And such are the relations of interdependence in society, that the duty of one is the right of another, which he may expect and exact. Duties and rights are reciprocal; and nowhere more truly than in the protection of public health and life does duty coalesce with self-interest.

Nor does the true doctrine of Providence disparage human care and effort, or neutralize duty. Absurdly and dangerously erroneous conceptions of this have sometimes prevailed. Great epidemics have been regarded as direct and special manifestations of Divine judgment, when they were really the indirect results of human ignorance, stupidity or recklessness. It is true the inspired word assures the devout believer that he is so under the Divine protection that he shall have no occasion to "be afraid for the terror by night, nor for the arrow that flieth by day; nor for the pestilence that walketh in darkness; nor for the destruction that wasteth at noonday." But this promise is only for those who "abide under the shadow of the Almighty"—and the shadow of heaven's protection does not cover those who violate heaven's laws. "Take no thought for your life, what ye shall eat or what ye shall drink; nor yet for your body what ye shall put on" gives no warrant for laziness nor improvidence. "He shall deliver thee from the noisome pestilence" gives no immunity to those who breathe the noxious vapors of sinks and cess-pools, or swallow the germs of disease with infected food or drink, or encounter contagion without disinfectant or other protect-

ive precaution. In physical as in spiritual soteriology, God works to will and to do in those who "work out their own salvation." The night-stalking pestilence and the noon-wasting destruction often follow the paths of men's neglect of God's laws in nature, and destroying epidemics are due often to causes largely preventable. It is not always Divinity that scourges the world with widespread desolation and death; oftentimes it is dirt. A more intelligent obedience to the Divine laws of life and health, and more care in improving and guarding the conditions of living would avert the calamity that sweeps the earth with a destroying breath.

There is a class of diseases called "communicable," that is such as by contagion or infection or otherwise are communicated from person to person and so spread through communities and often extend as epidemics from place to place, such as small-pox, diphtheria, scarlet fever, typhoid fever, etc. It is found that a large proportion of all deaths are due to the ravages of these communicable diseases, and their prevention would materially diminish the death rate, and prolong life. Again it is proved beyond reasonable doubt that these diseases can be prevented. Long-continued and careful investigations have resulted in the discovery of sanitary measures applicable to these various diseases, the faithful employment of which would effectually reduce their power, and often prevent their outbreak. I need only refer to the published reports of the State Board of Health, the data for which have been gathered and compiled under the direction of its enthusiastic secretary and his efficient aids. It appears that in various reported outbreaks of these several diseases in Michigan during several years past, instances where suitable methods of prevention have been faithfully employed have resulted in the saving of multitudes of cases of sickness and the prevention of thousands of deaths, as compared with instances where such measures were neglected or imperfectly or carelessly employed. And there is no means of computing the saving of human life and the prevention of death and suffering resulting indirectly from better methods of living which the diffusion of sanitary knowledge has produced. Christian morality sets a high value upon human life, and therefore magnifies the importance of whatever seems to protect and preserve it. Christian morality teaches the value of health, and therefore approves and honors whatever tends, in the man or in society, to prevent its impairment.

The duty of the citizen, then, from this standpoint of Christian morality is clear:

1. His duty and his interest alike require that he *personally conform, in his own way of living, to sound sanitary principles.* He is bound to observe cleanliness in his own premises, provide suitable drainage, pure water and pure air, and maintain the conditions of healthy living, so as to afford no soil congenial to the propagation of disease. And in cases of exposure to contagion, he is bound to respect the safety of others, even at the cost of submitting to whatever personal limitations and privations suitable quarantine may render necessary, and he must observe the precautions which safety may require. The Jewish law provided: "When thou buildest a new house, then thou shalt make a battlement for thy roof, that thou bring not blood upon thy house, if any man fall from thence." Commenting on this ancient law, another says: "The battlement was invisibly inscribed with a law, the essence of which is of widest and constant application. It is that sublime principle which mingles charity and accountability. We are our

'brother's keeper' whenever another's life comes within the line of our lives; when it is, as it were, on our roof. We are responsible for the evils that others bring upon themselves, even through their ignorance, stupidity or carelessness, if they have been influenced in any degree by us, and we have not done all in our power to prevent evil results." It is easy to see how this moral principle affects our duty in matters of sanitary science. No man has a right to allow his house or his premises to become a breeding place of contagion and death, so far as it is in his power to prevent it. He must effectually "parapet" his house and his life. And this duty is wide-reaching in its relations and importance.

Self interest emphasizes it, and this not merely upon the lower plane of pure selfishness, but upon the higher plane of noble manly endeavor. Self-preservation is a first law, and this not for personal gratification alone, but for the highest ministries of useful life. It is every man's duty to make the most he can of himself, and this includes the sacred preservation of his body in the best possible condition to be the instrument of the noblest, largest service to humanity and to God. The monkish theology of mediæval times taught the disparagement of the body, its neglect and abuse as a fleshly and corrupting thing. But this was an utter perversion of Christian teaching. Paul's reference to "this vile body" in a mistranslation. In our present state it is indeed a "body of humiliation," but in no sense "vile," until man in his wicked use of it makes it vile. An instrument created in perfect adaptation to the use of an intelligence that bears the Divine image, it may be not merely a clog and a hindrance, but a servant and aid to the spirit. The gospel portraiture of Jesus of Nazareth implies a fair and perfect specimen of physical manhood in one who never violated the laws of health, nor abused nor injured his body by ignorance or neglect. When the apostle said "present your bodies a living sacrifice," he did not mean to enjoin unnecessary exposure to premature death, but a consecration of the man, in his noblest estate, to the holiest service. A body wasted and incapacitated by disease, and a mind correspondingly impaired in its strength and vigor is in no just sense a "living" sacrifice fit to be offered in service to God.

Further, duty to society requires it. We heard last night sound and wholesome words from the Governor of Michigan about the interest of the State in the health of the citizen. The principles urged in his address imply the duty of every man to render to the State the very best service possible in his own avocation in life. Thus the just demands of government and humanity unite to enforce this moral obligation of personal conformity to sound sanitary principles of living.

2. Again it is the plain duty of the citizen to see to it that other people also observe similar care and conformity. A part of the people cannot, with successful results, observe the conditions of sanitary safety, while they permit others to disregard them. This will vitiate and neutralize all their own efforts. The community must combine and coöperate to secure the result, or it cannot be done. Herein is the justification and the importance of wise and effective legislation in this department. There must be health laws to regulate the conditions of living, and afford to society the necessary protection. The duty of the citizen is plain to secure the enactment of suitable statutes, and insist upon the faithfulness of the officials who are charged with their enforcement. As with all other laws, so with health laws, their

adequate enforcement will depend upon the support of an enlightened and quickened public sentiment in their favor.

3. Hence another duty of the people becomes of vital importance. It is their duty to inform themselves upon the questions involved; to know what they can about the nature of these dangerous diseases, and the methods that may be adopted to guard against them. The wide diffusion of intelligence, the popularization of the knowledge which specialists have acquired on these subjects, the education of the people with regard to these matters, is a duty of the most vital importance. The means of obtaining this information is at hand; let the people awake to its importance. For many years eminent specialists have been pursuing their investigations in regard to the nature of these dangerous communicable diseases. None of these eminent men will pretend that as yet they know all about them, or they would all agree. But it may be confidently asserted that they have found out many things which a few years ago were not known,—and what if we are often puzzled by disagreements amongst the doctors? This is only a disadvantage incident to the limitations of human knowledge, and the difficulties of investigation. Time and further light will help to more perfect knowledge and agreement. Our own State Board of Health has published monographs upon the nature and the means of prevention of several of these diseases, which in times past have often caused such fearful loss of life and so much suffering and distress. In these documents they have placed before the people the latest and most reliable results of these investigations and the most careful directions with reference to prevention. These instructions to the people are most valuable. The educational value of such conventions as this, with the other means employed by the sanitarians of our day for the diffusion of such intelligence as this among the people, ought to be appreciated, and such efforts sustained. The people ought to be willing, at whatever expense, to encourage the patient investigations of competent specialists, which may add to our fund of practical knowledge on these vital subjects of health and disease.

4. It is the duty of all classes of our people to cultivate on these subjects of sanitary science and sanitary laws and sanitary living, an intelligent and generous public spirit. A man who is esteemed to be without public spirit, who is selfish and stingy, who has no active sympathy with great public interests, is justly despised by the people. If there is any sphere of life in which selfishness ought to give way to a large-hearted humanity, it is here. And no illustration of it is more worthy of admiration than the enlarged and ennobling view now taken of the mission of this noble medical profession itself. It is beginning to be recognized that the province of the doctor is not only to cure people when they are sick, but to teach people how to avoid getting sick; that the highest and noblest work of the doctor is to teach people how to live as long as possible without the necessity of the attendance of the doctor. And there is no class of men who are doing more today to encourage this high ideal of the medical man's mission than the doctors themselves. And it may well be so, for the realization of this ideal by no means tends to dispense with the doctors, for, when public intelligence shall have risen to this high plane, the profession will then be more necessary to society than ever. It only changes in so far the method of applying their skill, brings it to bear at the points where it can be most directly and widely and permanently effective, and exalts their ministry to the public good. If

"an ounce of prevention is worth a pound of cure," is it not a nobler, a grander service, to prevent disease than to cure disease? If "the perfection of art is to conceal art," shall it not be esteemed the highest achievement of medical science to hide itself behind a well ordered regimen of public life, which its own skill and influence have produced, and with invisible hand mould and guard and conserve this social sanity as the most fragrant flower of the physical branch of a humane civilization? And why should not the common people, with ready, enlightened and grateful coöperation, aid in realizing this exalted ideal of the physician's calling? We shall do this when we own and practically act upon the belief that there is not only a law, and a science, but a gospel of sanitary living.

THE RESTRICTION AND PREVENTION OF DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE CITIZEN.

BY DANIEL T. HALL, TECUMSEH.

After listening to the papers read at this convention, I ask myself: What shall a poor thirsty mortal do? I am not a fiery furnace to have hot water with me all the time. If I drink water as found in a natural state I may die, for it is filled with foul impurities. I cannot drink beer, for that is the product of fermentation. I cannot drink whiskey, for it is not good for the complexion, and "the worm is in the still." I am told that any excreta diffused by the dry process fills the air with germs of pestilence, while if deposited in the earth the waters under the earth are polluted. We have heard of the vast ravages of typhoid fever in the State of Michigan. Far from me to decry the danger of this disease, but I believe there has not been a genuine case of that disease in this community within the last ten years, except one case last fall, which was brought from Ypsilanti. I believe that there are many deaths reported from this cause which are not such. Were we to have an epidemic of this terrible scourge, we would awake to the necessity of prompt action in protecting our water-supply, but let us not wait for such an occasion.

Dr. Baker scouts the idea of our paying our health officer fifteen dollars a year; but if we ever had one who earned that money, I beg his pardon for the doubt. If the health officer did his duty, would a foul pig-pen grace the center of our most crowded square, or cess-pools exist as they do within a few yards of a neighbor's well? I am here to speak for the people, and must speak plainly.

While it may be the duty of the health officer to restrict the spread of contagious diseases, very much depends upon the persons exposed or infected. With our present health laws and effective quarantines it is not only possible to confine a disease to first cases but it is a criminal action not to do so. Upon the people themselves depends the success of the physician's or health officer's restrictive efforts. Happily in our own State and community we generally find the people ever ready to assist to forward any movement in

this direction. How different was the conduct of the people of Michigan a few months since when the dread small-pox invaded our neighboring town of Milan and thousands of children were freely brought forward for vaccination, from the action of the ignorant French Canadians who a few years ago perished by hundreds with the same foul disease rather than fly in the face of Providence, as they believed they would if vaccinated!

The person who willfully exposes himself or others to contagion is guilty of a felony and should be punished for the crime; ignorance of the law is no excuse, and where the laws of contagion and prevention are as well known as they are today no excuse is valid.

As a boy I was taught that it was no disgrace to have the itch, but to keep it; today it is an almost unknown malady—the American citizen has nearly scratched it from the face of the earth. The infectious diseases of children that are epidemic at irregular periods can often be confined to a very few cases if the parents would rigidly isolate those affected, and the saddening effects of scarlet fever and diphtheria,—those scourges of child life and the terror of parents—would be greatly lessened. Many times schools are closed on account of the prevalence of these diseases which prompt action would prevent if proper precautions were taken at the first appearance. Delay will not answer. Contagion is the offspring of a monster that must be throttled in infancy or its birth prevented. He who accomplishes this is a benefactor to his race and worthy to receive the victor's crown.

There is a natural perversity in the most of humanity that is ever ready to resent any measures that may be taken to confine infected persons, many times concealing the existence of contagion until perhaps the entire community has been exposed. Nor is this confined to the people alone, but we find the physicians, the guardians of the public health, they who ought to be the first to sound the alarm, often through ignorance or prejudice, allowing free access to where contagion exists, they perhaps not making a proper diagnosis of the disease at first, and then too obstinate to admit their mistake. That such men have an existence all are aware. The man who will not confess an error in his judgment, but will allow innocent persons to be exposed to peril of life or limb, is not a proper person to entrust with the life or health of his fellow men. To misquote an old adage: To err is human, to confess an error is Divine.

Our State law says a place infected by a disease dangerous to the public health should be plainly placarded with the name of the disease. This not only gives warning to persons ignorant of its existence, but has a restraining effect on the careless and on children who might thoughtlessly expose themselves. Still we find an unwillingness among people to have their houses thus prominently marked, and it is not unusual for them to talk of partiality in passing the rich man by because he has money or influence, and giving the poor man undue prominence because he has neither, and the health officer who tries to do his duty finds himself the target for abuse and often threatened with personal violence if he does not have the obnoxious sign removed. Then the honored official, who works for nothing, with abuse thrown in, has to humbly swallow his pride, bow himself in humility and explain the benefit and necessity of isolation.

Upon the earnest support of the public must physicians depend in suppressing and confining all forms of infectious diseases,—then let people of every walk in life study the best means of prevention not from a scientific

standpoint alone but from a common sense every day view. Look at the progress already made in this direction. Within the memory of many persons whole Indian tribes have become extinct from the ravages of small-pox. Hardly an Irish family landed on the American shores but you would see the pitted victims of the same dread disease. Today you only hear of it in limited cases wherever protective measures are taken, and the same is true of kindred maladies. There are many things to breed and foster these infections and any process that will destroy these breeding places is a blessing. The existence of pig pens in the midst of habitations, cess-pools opening into the open air or into kitchen or woodhouse, fish or vegetables decaying in cellars or thrown upon the surface of the ground or into the creeks or rivers, may all be but hatching places for epidemics of the most virulent character, and should be banished from the land or frequently cleansed and purified by disinfectants. Do not wait for a complaint to be made, but watch and see that no cause for complaint exists. No particular amount of knowledge is required; some of the simplest and most common disinfectants are the very best for common use. Intelligence backed by the strong arm of the law and upheld and aided by the masses of the people is enabled by sanitary measures to prepare for many contagious epidemics and relieve them of their terrors. Let us be up and doing, ready to assist and promote the good work. Let us not leave it for the physician, but let every man, woman and child be a sanitarian.

THE RESTRICTION AND PREVENTION OF DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE STATE BOARD OF HEALTH.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING, MICH.

For the restriction and prevention of the dangerous spreading diseases, what is the exact nature of the work to be done?

I would not have the health officer or the board of health neglect any duty which is now required by law or custom. Nuisances should be abated, even if there is no absolute certainty as to just how they may cause sickness. House-to-house inspections by the health officer may well be maintained at regular intervals. Such inspections yield knowledge useful by the health officer in some of his duties, as, for instance, those for the prevention of typhoid fever. But none of these things, which it has so long been considered the sole duty of the health officer to attend to, have much to do with the restriction or prevention of scarlet fever, and probably not with diphtheria. For that work entirely different methods must be employed. To do this work, the health officer, and the people who coöperate with him, must have a good theoretical and practical knowledge of the "germ theory of disease." They must know that the "germs"—the contagia of some of the dangerous diseases—cannot, so far as we know, be reproduced outside the body of man or of some animal. A few years ago it was generally

believed that all we had to do to protect ourselves from all the dangerous diseases was to clean up and keep clean; it was thought that these diseases were all reproduced in filth. Now we know that this is not true; that, while typhoid fever probably is reproduced in filth, outside the body, or, if its specific cause is not reproduced, certainly it is stored in filth outside the body, and all ordinary measures of cleanliness are important for the prevention of that disease, it is not true that all diseases are thus caused, or that anything worthy of mention can be done for the prevention of some of the most dangerous of them by attention to ordinary cleanliness. To show you how strong the evidence on this subject is, I may mention that for several years there has been offered a prize of a thousand dollars to any person who will demonstrate the possibility of reproducing, outside the animal body, the vaccine virus, or a modified virus of small-pox, capable of preventing small-pox in the way well-known to be accomplished by vaccine virus propagated in man or animals. No one has claimed the prize. It seems to be impossible to find or to create any conditions outside the living body which will enable this contagium to reproduce. There is no positive evidence that the contagium of scarlet fever can be reproduced outside the body. There is question whether the contagium of diphtheria can be reproduced outside the body, and still more question whether in ordinary life it is so reproduced. One of the things which makes it improbable that it is so reproduced is the fact, proved by the statistics supplied by hundreds of health officers in Michigan, that simply by the isolation of infected persons and things, and their thorough disinfection, three-fourths or four-fifths of the cases and deaths from diphtheria which otherwise would occur are prevented. If the disease were generated in or by ordinary filth, it does not seem probable that isolation and disinfection would be so very effectual for its restriction and prevention. But it has been abundantly proved that any person or animal infected with the disease is extremely dangerous to all persons who are susceptible to the disease; that the contagium from the person or animal, even if it cannot grow or multiply outside the body, yet can lie for months and years dormant but virulent to produce the disease whenever it is breathed in by a susceptible person; that this contagium clings to clothing, books, letters, papers, walls of rooms, curtains, and articles of furniture, and may thus reproduce the disease long after the recovery of the person in whose body the contagium was formed; that, therefore, time alone cannot be relied upon to protect us from the contagium; that no ordinary cleanliness can protect us from it; that nothing is available for this purpose short of some gaseous disinfectant which will follow the contagium to the uttermost recesses of all cracks and crannies, and will then and there attack and destroy its life. The mode of disinfection which has been proved effective for the prevention of scarlet fever and diphtheria, in this State, is the exposure of all infected things to the fumes of burning sulphur; and the State Board of Health recommends that the fumes be as strong as will be made by the burning of three pounds of sulphur in a room ten feet square, or in each thousand cubic feet of air-space. Discharges from the throat and mouth are to be taken on rags and immediately burned. But for complete directions I must refer you to the pamphlets published by the State Board of Health.

It is important that you maintain a local health service so that, at a moment's notice, all the measures for the complete isolation of a person

sick with one of these dangerous communicable diseases shall immediately be put in operation; that, at any time, the appropriate disinfectants, for use in the sick room and after the recovery or death of a patient, shall be ready, and shall be faithfully and intelligently employed. It is important that you have, at all times, an efficient local health service so that, in case of need, you can have the benefit of the aid which can be rendered by the State Board of Health. A good health officer is powerless to protect you unless supported by the people. In order that the people shall support him in strong measures for the restriction of infected persons and things, they must know wherein lies the danger, must appreciate the importance of restrictive measures, they must know how isolation and disinfection are accomplished, and how they may be made imperfect, and deaths result. This coöperation of the people, which is so important, can be had if they can be led to see the truth, and they can be led to see the truth, if it is presented to them in the right way at the right time. In an outbreak of scarlet fever or diphtheria, if prompt notice is given to the local health officer, and by him to the State Board of Health, the local officer can promptly be supplied with pamphlets which tell, in brief language, just how to restrict that particular disease; and if the health officer distributes these pamphlets to the neighbors of the family in which the disease is, they will then be likely to read and to pay attention to the best methods of preventing the spread of the disease into their own families. They will be more ready to aid the health officer than they would be if left in ignorance of those best methods of restriction.

This may serve as a hint as to some of the ways in which an efficient local health service, coöperating with the State Board of Health, and securing the coöperation of the neighbors of those sick with communicable disease, may act for the protection of life and health in the locality.

The State Board of Health publishes, each year, a pamphlet of instructions to those local health officers who are for the first time elected for that service. The contents of that pamphlet also serve as reminders to those health officers already familiar with the duties of the office, also to call attention to any new laws which may have been passed by the legislature, or any new and useful fact which may have been learned from a compilation of the reports collected by the State Board of Health. Thus every locality that maintains an efficient health service which is actively in harmony with the State Board of Health, has the benefit of the combined experience of all the other similar boards of health throughout the State, and, in fact, of all the experience of similar organizations throughout the world; because the State Board of Health is constantly exchanging the reports of its work for the accounts of the work of other health officers and boards throughout the world. There is an old saying that "Dwarfs see far on giants' shoulders." This may serve to fix in our minds the fact that a very humble and ordinary person, acting as a local health officer in an ordinary village, may accomplish great results by life-saving measures, when he is lifted up and borne forward on the shoulders of all of mankind who are engaged in similar work, as he may be so aided if he puts himself in the way of such aid. In this work, the "giants" are always in existence; in many places throughout the world excellent public-health work is constantly being done; but it frequently happens that a locality fails to provide even a "dwarf" to act as a local health officer. I should be glad if each and every village in Michigan

would constantly employ the best physician within its limits as a sanitary adviser and health officer, one who would put himself on the shoulders of all the "giants" in sanitary science and public-health work, in Michigan and throughout the world, one who would be constantly employed for the prevention, and, when required, for the restriction of disease, and one who would thus save to the people of the village not only as much in money value as is expended for public-health work, but also a vast amount of pain, of sickness and agony, and the lives of children and other loved ones who without such public-health work are constantly being torn from their parents, relatives and friends.

REMARKS BY D. W. LOREE, M. D., OF RIDGEWAY.

I heartily commend the paper, just presented by Dr. Baker, to the favorable and serious consideration of all friends of sanitary science.

During the few minutes allotted me in which to continue the discussion of the subject from this standpoint, I will say, first, that the State Board of Health of Michigan, during the seventeen years of its existence, has proved itself an essential element of progress in the administration of the affairs of government.

Protection is the fundamental idea of government, which is a mutual compact. The citizen cedes certain rights, for which he is to receive protection from great and threatening dangers.

The government can act only through its officials. The members of the State Board of Health are officials, and in their capacity as a board are an essential element in facilitating the operations of the government and must be regarded as servants of the people. There can be no doubt in the minds of any who have been in attendance upon the sessions of this very important convention but that the Board of Health of Michigan, is ably and efficiently performing its duties in extending the protecting arms of the government continuously here and there whenever and wherever dangerous and communicable diseases threaten the security and life of the citizens.

During these sessions we have learned very much that is new and interesting in regard to the diseases named, their effects upon the living tissues of the body, the means of restricting and preventing them, etc., and it seems to me but fair that before parting we should give a few minutes to the consideration of the term "health."

Among the definitions of the term "health," by persons taken promiscuously in this audience we would receive from some, "the normal condition of animate nature," from others, "the condition upon which growth, perpetuity and usefulness depend," or we would be told that "it is the faculty of performing all the actions proper to the living organism in the most perfect manner."

A large number would agree that health means physical integrity, which it does, and a few would add moral soundness, purity and goodness as appropriate terms to indicate the absence of disease.

Some one has said that health in its larger sense implies a serious comprehension of the great interests of others. Admitting this to be a true statement we must conclude that that degree of selfishness always found bordering upon the realm of meanness is an abnormal condition, and consequently may justly be termed a disease, and the subject of it a degenerate son of the race as well as the man who is given to immorality and vice. Should any one wish to examine himself critically to determine the presence or absence of this disease he will facilitate the operation by taking an accurate measurement of the volume of "public spirit" he is conscious of carrying within his breast as an animating force in his make-up.

Health is one of the centripetal forces in nature and of the human race especially, or in other words, health is God's leverage upon the race, which he has been using since the day when Adam, a living adult man, became a living soul, to elevate his creature to a higher plane of civilization.

We may conclude that a man in full health is God's ideal, or that health is the acme of perfection in the physical and moral nature, and spiritual condition of man, and stops not short of the regenerating influence of Divine grace.

Health for its maintenance depends upon a principle, God-given, which in the living organism we call "blood," in government and law, "righteousness."

As pure blood bountifully supplied only in the great laboratory of nature is to the living body the vitalizing principle, so is "righteousness" in giving virtue and efficiency to government.

Studying that thought for a moment we are able to appreciate the fact that there are many diseases which may be properly classed together as "*blood poisons*," and included in the list of those dangerous and communicable; and also catch a glimpse of the deadly "*microbe*" or disease-producing germ which is the instigator of so many palpably dangerous and communicable defects in statutory enactments.

We do well to remember, my friends, that there is at this moment, a clearly established, unmistakable case of blood poisoning, coursing through the veins and arteries of the body politic, both of our State and of the nation, which is as dangerous to the citizens, and to the growth, perpetuity and usefulness of the State, as a real outbreak of an actually contagious and malignant blood poisoning disease, affecting and prostrating a majority of the people of every city in Michigan. Will any person in this audience pretend to say that the legislative enactments of the present or of any previous legislature of Michigan for the past ten years upon the liquor traffic question, have been upon the principle of righteousness?

Permission granted by legislative enactment to be bought and paid for by men legally authorized to become public tempters of other men to their utter ruin of both soul and body, is so manifestly wrong in principle, and all the resultant evils so terribly dangerous and threatening to the security and happiness of the citizen, that "*malignant blood-poisoning disease*" is the only fitting term to use, and even that does not adequately convey an idea of the gross immorality of the real condition. Blood being the principle of life and vitality, it is apparent that the agencies or forces acting upon it and all the tissues of every organ, agency and force in the whole economy are put in jeopardy when impurities and poisonous elements are introduced. For instance, the very first throb or pulsation of the heart upon bad blood is a blow at its own existence, because the nutrient blood-vessels which feed the heart tissue are compelled to furnish only that same poisoned blood to supply its needs for tissue building. Likewise the very first legislative enactment not in strict conformity with the principle of equal justice to all men, so framed as to give not only permission but encouragement and protection to iniquity and vice among the people is to do violence to the very life of legislation.

The Legislature of a State may be likened to the heart of man, and as "the works of men do follow them," and as bad blood is sure to return to the heart, so the pernicious influence of a bad policy adhered to will return to the source from whence it came to do greater mischief to the agencies and forces constituting the body politic of the State and nation; the proper performance of the actions pertaining to the departments of the State being interfered with, its growth is hindered, its perpetuity is endangered, and its usefulness impaired.

RESOLUTIONS.

Rev. J. S. Joslyn, A. W. Mills, D. T. Hall and O. P. Bills, Committee on Resolutions, then offered the following resolutions which were adopted:

Resolved, That the thanks of this convention are due to the members of the State Board of Health who have favored us with their presence, and whose very interesting discussions of themes which have a vital relation to our health and prosperity, which we believe will prove of lasting benefit to the community, also to the officers of the convention and especially to the President, Dr. Howell, to whose earnest efforts we are indebted for the convention, and the Secretary, Dr. North, for the able and efficient manner in which he has discharged his duties; to the publishers of the local papers for services rendered; to the musicians who by their singing and playing have added so much to the enjoyment of the occasion; also to his excellency, Governor Luce, for his attendance and interesting address.

AMERICAN
STATISTICAL ASSOCIATION

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

LUDINGTON, MICHIGAN,

JULY 11 AND 12, 1889.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF LUDINGTON.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1890.]

[Reprint No. 309.]

MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
DARIUS D. THORP, STATE PRINTER AND BINDER.
1889.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

LUDINGTON, JULY 11 AND 12, 1889.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1890.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT LUDINGTON, MICH.,

JULY 11 AND 12, 1889.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1890.

This Convention was held, in compliance with an invitation from the citizens of Ludington, under the direction of a committee from the State Board of Health and a committee of citizens.

The following persons were the local committee:—Mayor H. A. Scott, Chairman, G. P. McMahon, D. V. Samuels, E. W. Marsh, Dr. George W. Crosby, Secretary.

The committee from the State Board of Health consisted of Henry B. Baker, M. D., Lansing, Mich.

The officers of the Convention were:—President, Judge J. B. McMahon; Vice-Presidents, D. V. Samuels, Ludington, Dr. G. H. Cleveland, Pentwater, Dr. James A. King, Manistee, Hon. H. H. Wheeler, Ludington, George N. Stray, Ludington, Dr. E. P. Thomas, Scottville; Secretary, Dr. George W. Crosby, Ludington.

First Session—Thursday, July 11, at 3 P. M.

The Convention was called to order by the President, after which Hon. H. A. Scott, Mayor of the city, gave the following address of welcome:

ADDRESS OF WELCOME.

BY HON. H. A. SCOTT, MAYOR OF LUDINGTON.

Mr. President, Members of the State Board of Health, Ladies and Gentlemen:

In the history of our comparatively young city, this, I believe, is the first convention assembled within its limits for the purpose of discussing those questions which together will tend to develop the thoughts of all who shall appear upon this platform during its sessions, and crystallize them into practical ideas for the study of better physical health.

Ludington has not been behind her sister cities in her conventions, both political and religious, and assemblies in the interest of agriculture, educa-

tion and science; and now, as we are about to take another step up the steep hillside of knowledge in search of the fundamental and scientific principles for the better preservation of the health of this community, let us extend the right hand of fellowship and a most cordial welcome to the members of the State Board of Health, to those who have so kindly accepted the invitation to prepare papers and discussions upon the several important subjects announced upon the program, and to the fellow citizens here assembled. In behalf of our beautiful young city, I bid you one and all a hearty welcome, hoping that the sessions of this convention may prove to us all a season of growth in the knowledge of those matters which shall sweep from our pathway the germs of disease and death which beset us on almost every hand.

Hundreds of human lives have been sacrified in searching the Arctics and the Tropics for scientific knowledge; the oceans and the inland seas have been fathomed and made to give up the secrets of their darkest depths; the vast canopy over our heads has been explored and made to furnish us its secrets of science and knowledge; the very surface of the earth, almost from pole to pole, has been dug up and turned over, that its wealth of hidden resources might be utilized by man. The history of the world is conquest after conquest in search of that higher knowledge which shall disclose to us progressive ideas and intelligent thought. And while we may never discover that "fountain of youth" which has been the bright and shining goal of untold generations, yet with the aid of sanitary science and the minds which have made this science what it is to-day, the people are better prepared than ever before in the world's history to grapple with the causes and to a certain degree prevent many of the diseases to which flesh is heir.

In conclusion, it is to these gentlemen of the State Board of Health now with us, who are here to unwind the thread of that knowledge which has taken them years of close application and diligent work to place upon the heavily laden bobbin of honest, faithful research, and spread before us thoughts and suggestions of a practical and useful nature. We welcome them and their co-laborers who will also address you, and when the labors of this convention are finished, may we all, with one accord, feel that we have been vastly benefited by such an interchange of ideas so important to us all.

I am confident that the announced program will be well sustained, and, as knowledge only comes from a generous exchange of thought after close study and application, that we shall go to our homes after the close of the last session tomorrow night, better prepared than ever before to protect and preserve the health and strength of ourselves and those about us.

Again thanking you all for the privilege of welcoming our friends and neighbors, I wish the convention abundant success.

RESPONSE AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

(Reporter's Abstract.)

BY PROF. DELOS FALL, MEMBER OF THE STATE BOARD OF HEALTH.

This welcome is very cordial and is as cordially received. We hope that all the sessions of the Convention will be marked by the cordiality and good feeling manifested in the mayor's words.

What shall be the fruit of this Convention? We may learn something of it by looking at the program. This is a Sanitary Convention. The very essence of the word "sanitary" is health. We are here in the interests of health,—not that we are invalids, but that we may maintain and improve our health. In the seventeenth century the average duration of life was 24 years. It was a century of dirt, of superstition. Disease was looked upon as a visitation of a penalty. Since then there has been great advance. Good has come from the discussion of sanitary questions, and from legislation. These questions have become so practical that the longevity of the race is increasing. We see no reason why man should not live to the vigorous age of 100.

This program will introduce to you the character of the papers and discussions. If unpleasant topics are discussed, the fault is not in the discussion but in the thing itself.

The State Board of Health, in addition to its work at Lansing, holds each year five or six such conventions as this, presenting papers and discussions and then leaving towns to work out the suggestions made. But a vast amount of the work of the Board is done by its secretary at Lansing. Thousands of lives have been saved in this State, which were not saved ten years ago, by the careful attention now given to precautionary measures in outbreaks of dangerous communicable diseases.

We thank you, Mr. Mayor, for the warmth of this welcome and we will try not to abuse it. In our imagination we see the fires on the hearthstones to which we have been welcomed, but we will take the natural warmth of the day as the synonym of the warmth in your hearts.

PROGRESS, IN SANITARY SCIENCE AND IN PUBLIC-HEALTH ADMINISTRATION.

BY JUDGE J. B. MCMAHON, PRESIDENT OF THE CONVENTION.

In the history of public dealing with questions of sanitation, it is as apparent that "necessity is the mother of invention" as elsewhere. The notable advances in sanitary measures and regulations have usually been coincident with scourges and epidemics which have aroused the people from their wonted lethargy, and compelled the statesman to turn from his "pet measure" to consider the urgent, dire necessities of the people. The world rolled on and grew gray in utter ignorance of such a science, and the caprices of providence were made to shoulder the responsibility for all the disorders bred by filth, squalor and indifference. A science of health may be said to be a creation of yesterday. It has forced its way against the inertia of public sentiment. It is a service born of exigencies and emergencies, forced into being by dire necessities. Its worst enemies are "man's inhumanity to man," and his almost criminal indifference and ignorance. It was born, cradled and nurtured in the midst of plague and death. Even the schools have been slow to proclaim themselves its allies. It has had to contend with prejudice and superstition. The church has held aloof, fearing to

thwart the will of the Omnipotent. The State has been kept at bay by flaunting in its face the sacred privileges of the citizen and his inalienable right to as much dirt as he could carry about his person.

Thus it has only been by slow degrees that a science of health has been forced upon the people. We have been educated to it in a school in which experience has been the principal teacher, and has exacted and received his usual salary. This will become more apparent as we examine the history of the progress of this science in England. In 1831 the cholera swept away 54,000 of her people. Consternation seized upon the nation. Groping wildly for a remedy, certain limited powers for the enforcement of sanitary regulations were conferred upon the privy council. This august body may therefore be said to be the first board of health. The plague died away at length, only to reappear in 1838, finding the nation as illy prepared to cope with it as before. But we find an awakening of the sense that all this ought in some way to be prevented. Men begin to think and reason on the causes of the pestilence, and to wonder if after all it is no affair of the commonwealth that death is conscripting her citizens by the thousands. Drs. Smith, Arnott and Kay made a report to the poor laws commissioners on the physical causes of sickness and mortality which could be removed by sanitary regulations. This was the germ of a splendid growth.

But all this reached but few. Some inefficient legislation followed, but the masses were as ignorant and indifferent as before, and there was no adequate means of enforcing such regulations as might insure practical results. In 1854 20,000 people fell victims to the same dread disease. Certain localities had learned the lesson by the past bitter experiences and had to some extent enforced such measures as to secure a better water supply and cleanlier surroundings. These were comparatively free from the disease, and it now became apparent to the intelligent that some relation of cause and effect at least probably existed here. A large amount of sanitary legislation followed as the sequel; and in some localities was enforced fully and effectively. Again in 1866 the cholera appeared. It was now demonstrated beyond a peradventure that the remedy was to be found in sanitary measures. The cities of Glasgow and Aberdeen which had always heretofore suffered most heavily from the visitations of this disease had rigidly enforced the laws, secured a better water supply and were now almost exempt from the scourge, and easily controlled it. This actual experience was sufficient to satisfy the skeptical, and the path of progress became from this time forth easier. Legislation was gradually extended until in 1875 the Consolidated Public Health Act, as it is called, was passed, and with some subsequent amendments is the law of Great Britain still.

What have been the results?

I quote from an address by Sir Edwin Chadwick before the Association of Sanitary Inspectors of Great Britain:

"It has been objected that if it were possible to amend communities by Utopias, Utopias would long since have been introduced. Our proceedings—assumed to be Utopian—which I have to recite, are not, however, based upon Utopian ideals, but on "experiences" carefully and separately examined—separately examined as to their assumed and strict application to common conditions. It is no Utopia that death-rates in towns under the separate system of drainage have been reduced by one-half through the work of the sanitary engineer alone. It is no Utopia that the death-rate at Rugby, for example, which was one of the towns first treated by our first general board of health, was then twenty-four in a thousand, and is now only twelve. It is no Utopia that at Salsbury the old death-rate, which at the beginning of the century was as high as forty in a thousand is now

but about sixteen; or that at Croydon and a number of other places, death-rates of twenty-four in a thousand now average fifteen. These reductions have been effected by the system of "circulation *versus* stagnation," which is yet to be made generally understood, to be by constant and direct supplies of water, by the removal of the fouled water through self-cleansing house-drains and self-cleansing sewers, and by the removal of the refuse—fresh and undecomposed, and unwashed—on to the land."

"I find that at Rugby the life-rate has been extended to all living there, of every class, by eight years, or from thirty-three to forty-one years. At Hastings the duration of life has been advanced for males an average of five years and five months, but for females of eight years and one month. At Leek it has been extended by ten years; at Croydon and Salsbury and other places, the extension has been from six to seven years, females, as a rule, obtaining, by our science, the greatest share, that is to say, some eight years more of life-rate, more of painless life, more of health and strength and beauty. These extensions of the life-rates, as yet little known and regarded, belong, however, to all classes, both to the well-to-do and to the lowest. Of the wage classes, whose life-rate is largely the lowest, the extension will be found to be the greatest. To them the greatest gain developed is by the house alone, the "model dwelling," the work of the sanitary architect, giving ten years more of life and working ability, a result cheap to pay for by extra rents, and which would be still further improvable by the removal of surrounding deteriorating conditions, especially bad schools and ill-conditioned places of work."

I also quote from a paper by Erwin F. Smith before the Sanitary Convention at Ypsilanti, Mich.:—

"In 1874 Dr. John Simon, the eminent English Sanitarian, who was then Medical Officer of Health of the Local Government Board, gave it as his well-established conviction that the deaths in England each year were fully 125,000 more numerous than they would be if existing knowledge of the chief causes of disease, as affecting masses of population, were reasonably well applied. This statement not only passed unchallenged but was accepted by other English writers as substantially correct. It is equivalent to saying that one death in every four might be prevented. This statement by Dr. Simon has received direct confirmation in London and Glasgow, where active sanitary measures have reduced the death-rate over one-half in certain tenement quarters."

Captain Douglass Galton, C. B., D. C. L., F. R. S., in an address at the one hundred and thirty-third session of the society of Arts, London, November 17, 1886, on "The Progress of Sanitation, as Shown by its Life-saving Results in England during the reign of Queen Victoria," says:—

"In order to form an estimate of the saving of life due to sanitary measures, we may assume that sanitation remained in abeyance, and calculate what the death-rate, according to Dr. Farr's formula, would have been in consequence of increased density of population, and compare that with the actual death-rate; upon this assumption we find that the sanitary improvements only began to tell after the cholera epidemic of 1848-49. In the decade 1841-50, indeed, it appears that the death-rate was actually larger than that due to the increased density of population. But in the following decade the sanitary improvements began to produce their effect, and this effort has gradually increased. In the decade 1850-60 the annual average saving of lives in England and Wales from sanitary improvements was 7,789; in the decade 1860-70, it rose to 10,481; in the decade 1870-80, it was 48,443; and in the five years 1880-84, the average annual number of lives saved by sanitary improvements have been 102,240."

To sum up the matter, it may be said fairly that nothing approximating a public administration of health regulations existed in England prior to 1854, and yet in the comparatively brief period elapsing since that time splendid results have been secured. The tenement house system, the sewerage and water-supply, of the larger cities at least, are receiving the studious attention of scientists and statesmen. English prisons and jails are no longer the vile, death-breeding pens so mercilessly satirized by Charles Dickens, and the saving in the life, industry and bread-winning power of the nation is incalculable.

In this country the history is much the same. We inherited no love on this subject from the mother country. We, too, have been taught by epidemics. The cholera, the yellow fever and the small-pox have taught us, and we have conned the hard lines of these text-books for the little we know of that science which affects the welfare of the people perhaps more nearly than any other.

"Tho' losses and crosses
Be lessons right severe,
There's wit there, ye'll get there,
Ye'll find no other where."

In our own State we find in the laws of 1846 a provision that made the township boards of townships, and the common council or board of trustees of cities and villages, boards of health in their respective jurisdictions. Certain powers were granted them to prevent the spread of disease, powers of quarantine and to abate nuisances. These powers were untried and very little exercised. The local boards of health were ignorant of their prerogatives and were disinclined to act. There was no central head or purpose. A spasmodic effort in one township, perhaps unheard of in the next, had little effect upon the people. There was little practical result to be expected from the system, and more, there was no educational force in it. For, after all, the real aim of all reform should be to reach the masses of the people, and educate them to enforce the law of their own volition. When every family shall be its own official health board the law will operate automatically.

In 1873 our State Board of Health was organized under the act of that year, and since that time the progress made in our State has been remarkable. This board consisting of six members, appointed by the Governor, with the consent of the senate, was intrusted with the duty of special study of the vital statistics of the State, and given a supervisory control of local boards, who were required to report annually and at other times to the State Board.

In my humble judgment the appointment of a State Board of Health was the greatest advance by far ever made in Michigan in the direction of sanitary science. Before that time certain township, village and city officers were *ex officio* members of the local boards of health, but some of them didn't know it, and others, if they knew it, didn't know their duties or make the slightest attempt to fulfill them. I never heard of the meeting of a local board of health prior to 1873. Did you? Perhaps the greatest work of the State Board has been to breathe a little vitality and energy into these local boards, to secure uniform action, and to systematize efforts for the suppression and prevention of disease, and to secure statistics from all parts of the State. They have also accomplished a great amount of good by circulating pamphlets treating of vital questions relating to health, and instructing members of local boards in their powers and duties.

I quote from an address by Henry B. Baker, M. D., Secretary of the State Board of Health, on "Recent Advances in State Medicine" at the thirty-ninth annual meeting of the American Medical Association:—

"An important factor in sanitary progress is the increase in the number of persons who enter, more or less permanently, upon some branch of sanitary work. In many of our States such increase is very great. For instance, in Michigan when the State Board of Health was organized, in 1873,

there was hardly an active local board of health in the State; very few local health officers were appointed; while for the year 1887-88 over thirteen hundred local health officers were appointed in the State, and many of them physicians who devote considerable time to the work." * * *

"It appears, therefore, that there has been great progress in our knowledge of the relations of sickness to meteorological conditions, so that, in Michigan at least, we are now able to say under what meteorological conditions each one of many of the most important diseases will increase or decrease in prevalence. The times, or at least the conditions of the rise and fall of the sickness from these diseases* can be predicted in advance with almost as much accuracy as can the recurrence of the seasons. This may seem to you like laying claim to one of the grandest of recent human achievements, but I think the statement is strictly true, and this knowledge of the conditions tending to the occurrence of diseases, should aid us greatly in the adoption of measures for their prevention."

In the limits assigned me, I can pursue the history of the progress of sanitary science no further. No doubt this history in each State and country abounds with instructive lessons. Truly the aim of this science is a splendid one. To overcome the evils incident to a denser population, to lengthen and beautify human life, to add to its productive power, its energy and capacities for enjoyment, to insure for the State, for God and humanity a healthier and therefore a more normal manhood and womanhood, to drive from the horizon of childhood the wan, weird, gruesome forms of disease and death, to lessen crime, which is also a disease, and to bring back the pristine glory of manhood left at the closed gates of Paradise—these may be counted as among the ideals of the enthusiast on this question. We may dream, for dreaming is among the prerogatives we cannot dispense with, but if he who "makes two blades of grass grow where but one grew before" is entitled to be called a benefactor, surely he who supplants the tears and wails of stricken childhood with its merry, happy, healthful laugh, who drives away the phantoms of a life of misery, squalor and crime, and opens wide the doors of opportunity and usefulness, has earned the Master's word of praise, for he has remembered His chosen little ones. There sits behind the clouds no grim and fateful deity, but rather He who has willed that we should work out our own salvation, physical as well as spiritual, "with fear and trembling."

July 11, 1889.

THE HYGIENE OF SCHOOLS.

BY REV. I. W. M'KEEVER, LUDINGTON.

I approach this subject oppressed with the question,—What can I say that has not been said a hundred times better than I can say it, by men who have given it far more thought and investigation than I? I surely have no claim to originality and can not speak with the authority of one who has given time and earnest effort to original research. But, if I cannot speak as one having authority, I can at least speak as one of the scribes who, for the most part, must depend upon what other men have considered and settled.

After all, I know that the great principles which have been of the most value to the world have only been accepted and made practical after long

* Influenza, tonsilitis, bronchitis, pneumonia, croup, diphtheria, scarlet fever, small-pox, consumption, remittent fever, and typhoid fever.

and patient reiteration, until they have become as familiar as household words. We must not expect results from homeopathic doses. We must give heroic treatment. The community must be flooded with the truth till the people have become saturated with it, and then at last, we may expect them to give attention to these things which so deeply concern them.

There is something strange in our human nature that renders people most unwilling to give attention to the things that are really of the most interest to them. Let some mountebank drive out on our streets with a showy wagon, rattle a tamborine and proclaim the virtues of some quack nostrum, called "Elixir of Life," "Mons Mendacorum," "Tomphooloria" or having some other high sounding title, and the people will flock round him, and freely pay their money for the cheat, but talk to them of the value of pure air which is offered to them without money and without price, and they will turn away from you with their noses pitched at an angle of 45°, as though they would say, in the slang of the streets: "What are you giving us any way?" Pure water, the masses of the people think very little about, but find somewhere a spring that smells to heaven with its vileness, and you have a very fountain of health, to which the sick and afflicted will flock in all eagerness and expectancy, and even well people will come with the hope of curing the diseases which they are going to have. Especially will this be so after you thoroughly advertise and get some chemist to give you an unmeaning analysis, that you may blow it over the country as the assurance that science has put the seal of approbation on its nastiness. Some perhaps may be relieved in spite of the noxious stuff which they are pouring down their throats, for it is wonderful how patient nature is with its abuse, sometimes, and what power there is in her recuperative forces. Possibly this is one of the places where mind cure comes in, or a more exalted faith in that mysterious power that comes bubbling out from the hillside; or it may be from the Similia Similibus principle that the filth disease which has been developed by unwholesome living, is relieved by this other vileness: "The hair of the dog that cures the bite," or, it may be that this is purity itself as compared with the surroundings of the home life, and therefore nature grapples hopefully and energetically with the lesser evil. Do not understand me to condemn all mineral springs. I am not competent to settle that matter. I must leave such things to the medical faculty who are better able to sit in judgment upon them. I do not think, however, that it requires that a man should be educated in the medical schools, or to write M. D. after his name in very large capitals, to be able to determine that pure water is better than polluted, whether it comes from beneath the surface or above it. Perhaps physicians' prescriptions would be improved if the percentage of aqua pura were very largely increased. I have no doubt that many a patient would be much better off, if he were to take the advice of a competent physician rather than the drugs which custom and the prejudices of the people compel him to give. I hope the druggists will pardon me if I seem to trench on their business, but they need not be very much alarmed, for people will still continue to take their drugs rather than my advice.

Surely, there is nothing to which the community ought to give so much attention as to the health of its people, unless it may be to their morals, and indeed, the two are so closely associated that the one can hardly be attained without giving attention to the other. "Cleanliness is next to godliness," says Wesley. He ought rather to have said: "Cleanliness is a part of god-

liness." A pure spirit and a sound mind in a healthy body is the ideal of manliness. A strong mind in a weak body will be at as great a disadvantage as the skillful mechanic with poor worn out tools. Hence, every system of education that gives attention to the intellect alone, and neglects the body, is abortive and vicious. If it is important to give attention to the cultivation of the intellectual and moral nature, in youth, because the mind is then in a more plastic condition and more capable of receiving lasting impressions, for a similar reason, it is important to give attention to the physical man at this period of life.

It is not quite true that what a man is at twenty he will continue through his whole after life, but the exceptions are scarcely more than enough to prove the rule. That is to say, a young man who is sound in principle and well grounded in virtue, at that age, will not be very likely to fall under the power of evil habit and become an outcast from society, while a young man who at that age has become a slave to his lusts and evil propensities gives but feeble hope of future virtuous manhood. This truth, so universally accepted among moralists, ought to be accepted, equally, by those who have the health of the community in their charge. A strong, healthy, vigorous body at twenty betokens a long life with the ability to bear heavy burdens. I presume it is true that the seeds of most diseases from which men and women are suffering have been planted in the foolishness, recklessness, and ignorance of youth. Or, at least, the unwholesomeness which has surrounded the young life has so enervated and injured the body that it does not have the resisting power to withstand disease or the recuperative energy to throw off the evil influences that take hold of it. All the instincts of parental love, therefore, all the better impulses of philanthropy ought to lead us to spare no pains or expense to give the children of the community the best possible chance for healthful and vigorous life that, under the divine law of heredity, a grander and a mightier race may be found among our descendants.

A man with a sharp, keen intellect, well developed and highly polished, but who lives only to twenty-five or thirty, or under the constant groaning of infirmity, to forty-five or fifty, is not of as much worth to the world as one who continues a vigorous life to eighty-five or ninety, even though he may not have been so highly cultured. Juvenal says: "Our prayers should be for a sound mind in a healthy body." It is only through the healthy body that the sound mind can do its effective work. The formative period of school life, then, demands the most serious and earnest attention, that we may give our children the best possible conditions for physical development.

Perhaps there are four fundamental elements involved in these conditions, viz.: Pure air, pure water, good sunlight, and well regulated exercise. In the construction of school-houses, all these ought to be considered, and no pains or expense should be spared in consulting the best authorities and providing every adjustment and arrangement to meet the requirements. If there is necessity for economy, it surely ought not to be at this point. It is a mistaken economy that will risk the health of the children for the sake of saving a few dollars.

In the year 1880 prizes were offered in New York for the best school-house plans, and the committee who made the award based their decision on the following considerations:

"I. At least two adjoining sides of the building should be freely exposed to the light and air, for which purpose they should not be less than sixty feet distant from any opposite building.

"II. Not more than three floors should be occupied for class rooms.

"III. In each class room not less than fifteen square feet of floor area should be allotted to each pupil.

"IV. In each class room the window space should not be less than one-fourth the floor space, and the distance of the desk most remote from the window should not be more than one and one-half times the height of the window from the floor.

"V. The height of the room should never exceed 14 feet.

"VI. The provisions for ventilation should be such as to provide for each person in a class room not less than thirty feet of fresh air per minute, which amount must be introduced and thoroughly distributed without creating unpleasant draughts, or causing any two parts of the room to differ in temperature more than 2° F., or the maximum temperature to exceed 70° F. This means that for a class room to contain fifty-six pupils, twenty-eight cubic feet of air per second should be continuously furnished, distributed and removed during school hours. The velocity should not exceed two feet per second at any point where it is liable to strike on the person.

"VII. The heating of the fresh air should be effected either by hot water or by low pressure steam.

"VIII. The fresh air should be introduced near the windows; the foul air to be removed by flues in the opposite wall.

"IX. Water-closet accommodations for the pupils should be provided on each floor.

"X. The building should not occupy more than half the lot."

I quote these from a pamphlet issued by the American Public Health Association, and prepared by D. F. Lincoln, M. D., of Boston.

These principles, accepted and adopted by such high authority, deserve earnest attention, and are not difficult to be realized in a city like Ludington. I think, so far as I can judge without careful investigation, our new high school building complies fairly well with most of these conditions, but not all.

As to the hight of the building, the time has come when the lofty and imposing structures which have heretofore been the boast, especially of our smaller cities and country towns, must come down at the behest of the more weighty consideration of the health of the pupils. It is well understood that climbing long stairways is exceedingly mischievous, especially for girls at the critical period of their lives. In smaller cities and towns no school-house should be higher than two stories, with broad, easy stairways, every step exactly of the same width throughout, and so arranged as to give as little chance for accident as possible, and especially to provide against serious danger in case of panic in alarm of fire. And to this end teachers ought to drill their pupils so that they will know exactly how to behave themselves in such a case.

Such matters, however, are easily arranged. But when it comes to the question of how we shall provide a sufficient amount of well warmed, good, pure, wholesome air we have a more difficult problem to grapple with. Indeed, I question whether the problem of heating and ventilation has been thoroughly solved. Perhaps the next objective point for inventive genius

in this matter is to invent a janitor with brains and common sense, to apply the machinery that is put into his hands.

Authorities differ very much as to the amount of space required for each pupil. Prof. Kedzie, of our own State, claims that there should be not less than 300 feet, and, on matters pertaining to practical science, he is pretty good authority. For a class of fifty pupils, this would require a room 37 feet long, 29 wide and 14 high. We should then have floor space of about 22 square feet for each pupil. This would be a larger room than we usually find, and perhaps larger than is practicable or necessary, if other conditions of ventilation are properly attended to.

Vitalizing air is composed, essentially, of the two gases, oxygen and nitrogen, in nearly the proportion of one to four by measure with a small quantity of carbonic acid gas always present. [The exact quantities are N. 79.02, O. 20.94, CO^2 .06] Besides these, there will always be found watery vapor, and often traces of ammonia and nitric acid, and other substances depending on local influences. The carbonic acid gas, if it exists in quantities much above the ordinary, becomes poisonous. Fresh air should always be introduced from the outside, for cellar air is more or less contaminated. Perhaps we will never find it absolutely pure, but outside impurities, we will disregard, since they come from conditions beyond our control. Respiration is a process of combustion, and the products of all ordinary combustion, are water and carbonic acid gas by the union of hydrogen and carbon with the oxygen of the air. Thus, the vitalizing power of the air is reduced, while the poisonous carbonic acid is added, until at last it becomes unfitted for the purposes of life. Fresh air contains about four parts CO in ten thousand and when it becomes six parts in ten thousand, it is oppressive, and needs to be changed. I will quote a passage from the essay of Dr. Lincoln: "Assume that fresh air from out of doors contains 3½ parts in 10,000, which is a little below the usual rate. A room of the capacity of 10,000 cubic feet, freshly filled with air, and tenanted by one man, would receive from his lungs an addition of 2½ cubic feet of carbonic acid, in 4 1-6 hours, raising the total to six cubic feet. If, then, 10,000 cubic feet will last four hours, the supply for one hour, should be 2,400 cubic feet, or for one minute, 40 cubic feet." The supply of fresh air therefore ought not to be less than 40 cubic feet per minute, for each person in the room, or for a class of fifty, we should have not less than 2,000 cubic feet per minute, in order that we shall have comfortable, wholesome breathing.

But carbonic acid gas is not the only, nor the most dangerous product of the vital processes. In going into a crowded and badly ventilated room, one readily appreciates the unwholesome character of these poisonous exhalations. They must be removed as rapidly as possible. It is impossible to get pure air into a room without taking the impure air out. But these are ponderable substances, and cannot be removed without the expenditure of force. The hot air, coming into the room, rises at once, to the ceiling, and by its pressure, will have a tendency to drive out the foul, but that is by no means sufficient. A large flue must be provided in which a strong current is produced by means of heat. Usually, the chimney itself may be utilized for this purpose, by putting a smoke pipe of galvanized iron in the center, and leaving large space around it, into which openings from the room may be made for the egress of the foul air. These ought to have about twice the capacity for the openings for the ingress of the fresh air. The

opening for this purpose ought to be at the floor, not because the carbonic acid settles to the bottom, as is sometimes supposed, but because the pure air will rush immediately out if the openings are at the ceiling. The breath, coming heated from the body, will rise and soon distribute itself throughout the whole space, and, therefore, all the air in the room must be removed and changed every few minutes. I think there is a mistake in No. VIII which I have taken from Dr. Lincoln's essay. I do not think that fresh air should be introduced near the windows, but at the center of the room, where, rising to the ceiling, it will be more evenly and rapidly distributed. The windows, being cooler than any other part of the wall, will tend to produce a downward current and, therefore, flues should be provided near them, for the outward flow. All bad odors indicate the existence of poison, and demand immediate attention.

The advantage of hot water and steam for heating is, that they will not give off any of the gases that arise from the combustion of fuel. The difficulty with the hot air furnace is that it is almost an impossibility to construct one that will not leak carbonic acid gas or the more poisonous carbonic oxide. Still I would prefer the hot air furnace to any heating arrangement that depends upon direct radiation, which merely heats the air that is in the room, and provides no way for its renewal. But time and space will not allow me to go more fully into detail upon the subject of heating and ventilation.

The disposition of excreta is one of the most troublesome questions with which we have to deal. The best that can be done in towns having waterworks and proper drainage is to connect all water-closets and urinaries with the sewer and have them carefully examined and thoroughly cleansed. Water-closets and privies should be comfortably warmed, otherwise there is certainly great danger that exposure may produce serious consequences. There is no sanitary condition that needs more careful supervision than that pertaining to these arrangements, and yet, as a rule, teachers seem to feel very little responsibility for them. There is great danger both of moral and physical pestilence from them.

There are many questions pertaining to the care of the eye and the ear that I must pass over, as it is hard to condense a volume into an essay of twenty minutes. The school room needs to be pleasantly lighted, but the light ought not to fall directly into the eyes of the pupil, but upon the page from which he is reading or studying. The eyes need rest every few minutes, and the pupil should be taught to look away from his book and think over what he has read. In this simple way he is not only saving his eyes, but he is cultivating a habit of self dependence. If I were talking to a company of teachers, there is one matter pertaining to eyes that I would like to speak of, because it was a source of great trouble to my childhood days. There is always danger of mistaking defective vision for carelessness and inattention, and so giving harsh and undeserved reproof, that leads to discouragement. Being troubled with astigmatism, I was not able to read as readily as other boys, but neither my parents nor teacher knew of the difficulty, and so, I received credit for stupidity that did not belong to me, but after I had shown by some aptness in other studies that I was not entirely stupid, my poor reading was attributed to carelessness and I was scolded more than ever. I was doing the best I could, but I was only able to see one word at a time and so I must move slowly and in the effort to read faster,

and appear as smart as other boys I would miscall words and then, as my father said, I would have to backstitch. I do not know but it would be well for all children to be carefully examined, that all difficulties of the eyes may be thoroughly looked after.

Eyes and ears should be trained and not abused. A teacher who would strike a pupil on the ear should lose his head at once. He is either too ignorant or too heartless for a teacher.

Frequent changes from intellectual to gymnastic exercises are important, and there should be intermissions, when the children might put on their wraps, and engage in some exercise, while the room was being thoroughly aired. Little children ought not to be kept in one position more than fifteen or twenty minutes at a time, and none below the High School more than half an hour. I am inclined to think that children below ten years of age ought not to be kept in school more than two hours in the forenoon and the same length of time in the afternoon.

But the time assigned me will not allow me to proceed with the farther discussion of these exceedingly important and interesting matters.

DISCUSSION OF THE SUBJECT OF SCHOOL HYGIENE.

Prof. Delos Fall, member of the State Board of Health, Albion, in opening the discussion, spoke substantially as follows:

It is a fact that our boys and girls live under better sanitary conditions than we did when we were children. In our day children were frequently seen scratching between the fingers, and the disease which that indicates was a prevalent one, but it is largely done away with now. So warts are passing away because of more attention to sanitary science. In a tropical city I saw a group of women seated in single file on the ground, with the hands of the one behind combing the hair of the woman in front. That is a zoölogical fact—the fact of the presence of parasites in the hair. Fifty years ago that parasite was a common thing in the heads of children. The next generation will be better than ours.

There are many practical suggestions in the paper just read which are very valuable. Teachers are too thoughtless in regard to sanitary matters. They should spend more time informing themselves as to specific facts.

For example, Mr. Blaikie, in that valuable little book, "How to Get Strong and How to Stay So," says: "Probably more men walk past the corner of Broadway and Fulton street, in New York city, in the course of one year than any other point in America—men of all nations and ages, heights and weights. Look at them carefully as they pass and you will see that scarcely one in ten is either erect or thoroughly well built. Some slouch their shoulders and double in at the waist; some over step; this one has one shoulder higher than the other, etc. A thoroughly erect, well proportioned man, easy and graceful in his movements, is far from a frequent sight." Some are so from hereditary influences, many have brought themselves to their present condition. All may improve their condition."

Take a view of the same subject from another standpoint: Dr. Chaussier, with a view of determining the cause of abnormal peculiarities in men, examined 23,200 newly born infants, and as a result of that examination made the significant statement that out of this large number only 122 were

found to be abnormal in any respect, so that it was quite plain that children as a rule are straight and perfectly formed when they start for school.

Are there any facts, physiological or anatomical, which the teacher ought to hold in view as he takes these perfect bodies into his hands to manipulate them, for good or ill, for a period covering upwards of one-fourth of their entire lives? I think so. It is not enough to dismiss the subject with the very general statement that the child is given to the teacher in the plastic and formative period of life and that, therefore, there should be great care taken not to do anything harmful. Such an attitude toward the subject generally ends in doing nothing. The teacher needs to have before him definite and specific facts upon which a course of procedure may be based. For example: Suppose, to punish a child, the teacher compels him to stand for an hour or more in one position on the floor; what relation does this simple and apparently insignificant incident hold to what Mr. Blaikie saw on Broadway? Much, very much. The anatomical fact needed here is this: The tibia and fibula in the lower leg, and the femur in the thigh, begin to ossify (change to bone) at from three to five centers, but *do not complete that process until the twentieth year.* That is to say, a child's skeleton during all his school life is not resisting and inflexible bone, but, on the contrary, yielding and flexible cartilage; to subject any portion of it to any unnatural strain, or for any length of time, is easily, and it may be permanently, to change its form. What is true of the bones of the leg is true of all the other bones of the body.

The great Aristotle, the father of Zoölogy, announced that the backbone of a lion was a solid piece of bone. That anatomical error has been corrected long ago, but apparently some teachers still perpetuate a like error as applied to a boy's back. A boy's back is not solid; it is made up of a hundred or more separate pieces of bone. Study Gray, that great authority on the anatomy of the human body. He says that each vertebra is formed of three primary cartilagnious portions, that some ossification takes place during fœtal life, but at birth these three pieces are perfectly separate. No marked changes occur before the age of twelve years for the girl or fourteen for the boy, except a gradual increase in the growth of these primary centers. At sixteen years, four secondary centers of ossification appear; at twenty-one years, a thin circular plate of bone is formed in the layer of cartilage situated on the upper and under surface of the centrum or body, the former being the thicker of the two. All these become joined, and the bone is completely formed about the thirtieth year of life.

Do these facts lead to a clear conception of the fact that there is serious cause for alarm in the constrained positions into which our children are forced by those teachers who love military precision more than they intelligently love the best development of the child's body, who will have order and machine regularity in their school if it is at the expense of strained and distorted skeletons. Freedom to move about, frequent changes of position, natural postures of the body, intelligent regard for proper posture,—these are the natural corollaries of a study of the question such as has been suggested. Out of 16 young ladies, members of the senior class of a high school, seated on the stage of an opera house during their graduating exercises, only one assumed a correct posture in the chair. Only one sat erect. Analyze this case carefully and ask for the cause of this marked departure from a natural, easy and graceful position. The answer is to be found in the fact that some

physiological truths have been lost sight of by both teacher and pupil. What are these facts? In the first place the body should be erect because only in this way are the internal organs kept in positions natural to themselves and in their natural relations to the other organs,—only in this way can they perform their natural functions. Can breathing and circulation, assimilation and disassimilation go on in a normal fashion? In the second place, the erect posture can only be secured and maintained by muscular action. It should be remembered that muscular action is as necessary an act while we are standing or sitting as when making active movements. It is to save this muscular action that the temptation comes to assume a posture as near to lying down as a chair will permit, and this yielded to again and again leads to a habit and the habit leads to permanent deformity.

Parents as well as teachers should understand these matters and also the necessity of proper air and pure water.

Arthur Hazlewood, M. D., member of the State Board of Health, Grand Rapids, thought that trustees were as much at fault as teachers. The constrained position of children in primary grades is largely due to the shape of the seats. Small boys have to sit in big seats. He thought this one of the strongest criticisms to be made on our public school system.

Second Session, Thursday July 11, at 8 P. M.

THE PRESENT AND FUTURE WATER-SUPPLIES OF LUDINGTON.

BY W. H. TAYLOR, M. D., LUDINGTON.

Water has long been regarded as a symbol of purity. Nevertheless, in spite of the transparent, sparkling and refreshing character of the element it has in the past and still is insidiously carrying the seeds of disease to many of our race. Absolutely pure water does not exist in nature. Even the vapor of the atmosphere which surrounds our globe is more or less charged with impurities and rich in minute organic life. The germs of the latter owing to their great volatility are carried by winds hither and thither to high altitudes and long distances, and are brought back to earth again in drops of rain or flakes of snow. The great fall of black snow which occurred in Michigan a few years since owed its unusual color to microscopical vegetable spores. And the so-called mountain fever has been traced to these spores in melting snow carried into sources of water-supply. The earth itself is also a common source of polution. Water is gathered in streams, ponds and lakes over and through soils rich in decaying animal and vegetable matter. The head of the lake and the banks of the river too often give life and sustenance to innumerable minute organisms,—germs of disease. The purest water is obtained only in uninhabited or, at most, in sparsely settled regions. Surface drainage from uncultivated ground especially of a marshy character contains a large amount of vegetable matter, from the decomposition of which under certain conditions of the soil and temperature is developed malarial poison.

For a number of years since, our city has used the water supplied by the water-works, and, although at times the water has been most vile, no epidemic of a serious nature has prevailed. In fact, our city has been reasonably healthy. Nevertheless we should be up and thinking and take advantage of the error of our neighboring city, Manistee. If we do not, we may be painfully cognizant some day that the laws of Hygiene cannot be trampled on with impunity. When a man begins to take special precautions as to his diet or exercise, having in view rather his future health than his present comfort and taste, he has in most cases already begun to suffer from the effects of his imprudence and does not commence a hygienic course of life as a perfectly sound and healthy person. The same is true of a community. It will not usually submit to the burden of taxation necessary to secure drains and sewers or a proper water-supply, until the neglect of these things has resulted in such an amount of disease and death as to forcibly call attention to the matter in the city. It is not quite two years since the sewers were constructed and their contents poured into our reservoir of drinking water, the little lake. The outlet is the channel from which the people of this city are supplied with water. Before the sewers emptied their pollution into the lake, it received all the drainage from the city, as the ground slopes towards it from all directions.

It is a fact that we are being supplied with such filthy drinking water and not one official step has been taken to remedy this uncalled-for outrage. By the expenditure of a few thousand dollars we might have water direct from Lake Michigan and beyond the blue water mark. Do we need a change in our water system? If not we ought to find the water clear and pleasant to the taste and without smell. The future system demands a change. A change is contemplated, but the danger is in the delay. If the city owned its own plant it would be under the direct control of the proper authorities. In my opinion it would have been better for the city to purchase the plant when it had an opportunity if it had been obliged to pay a few thousand dollars more than it was thought worth. Now the probability is that we will have no change until the investment will pay for the extension of pipes out into Lake Michigan.

But if we must use this water from our present supply let not a quart of it be drank without first boiling it, as it will save untold numbers from sickness and perhaps death.

G. W. Crosby, M. D., then read the following paper by John A. Mitchell, C. E., of Ludirgton, on "The Sewerage and Drainage of Ludington."

THE SEWERAGE AND DRAINAGE OF LUDINGTON.

BY JOHN A. MITCHELL, C. E., LUDINGTON.

The sewerage system of this city was adopted in 1885. The plans were prepared under authority of the city council by Mr. H. W. McDonald, a civil engineer of Bucyrus, Ohio. They comprise plan and profile of each street in the city, upon which are shown the size, grade and location of

sewers as well as the curb grade of the street. Maps of the city have also been prepared showing the main and sub-sewer districts.

The system of sewerage is what is known as the combined system. That is to say, sewage of all kinds as well as the storm or surface water is conveyed to the point of discharge by the same system of pipes. The plans contemplate the use of glazed sewer pipe only. The sizes of pipe used for mains range from 12 to 24 inches, and for laterals, from 6 to 9 inches in diameter. Man-holes are to be placed at intervals of about 370 feet and catch basins at all street intersections or where required, the catch basins to be provided with stone or iron covers, with iron grates and to be trapped. The pipes from catch basins lead into man-holes. The grades as established for the sewers are generally uniform and are ample for the complete sewerage of the city.

Considered topographically the city may be separated into three districts: (1.) An area of about 80 acres lying north of Court street and west of Main street, discharging its sewage into Lake Michigan. This area is nearly level and has an elevation of from 12 to 20 feet above Lake Michigan. (2.) A tract of about 300 acres lying north of Pere Marquette street and west of James street, excepting that portion already described, having its outlet or drainage into Pere Marquette lake, for the greater part through a sewer projected up the little valley running northeast from the intersection of Robert street with Ludington avenue. The lower portion of this valley, or that portion from Ludington avenue to its point of discharge, comprising about 80 acres, is nearly level and only a few feet elevated above the surface of the water in Pere Marquette lake. It is partially covered with decaying vegetable matter and mill refuse and at times of high water in Lake Michigan may be said to be flooded with water. Above Ludington avenue the valley gradually narrows from a width of about 400 feet to 50 feet at its crossing at Delia street, retaining its wet, mucky top soil and quicksand sub-soil with numerous springs of water entering at its sides. The land on each side of this valley is usually high and nearly level. Above Delia street the valley widens out and continues low and swampy. (3.) That portion of the city lying south of Pere Marquette street and east of James street including the fourth ward, has its drainage into Pere Marquette lake. The surface of this area rises with a nearly uniform grade from the little lake to the city limits, having an elevation of about 50 feet at the latter point, the eastern portion, however, being somewhat broken and rolling.

The soil through the city where sewers have been built is a light sand and in many places at a depth of from 8 to 12 feet verges into quicksand, rendering it quite expensive and difficult to secure good foundations and close joints.

The city has expended in all about $20,000 in sewer building. Most of the work done has been with reference to local necessity, keeping in view the general plans with the object of ultimately completing the system as laid out.

The sewers already built may be described as follows:

The Robert street sewer, a 24 inch main extends from the intersection of Robert and Foster streets up the little valley, already described, to the east side of James street, a distance of 2,600 feet. The outlet to this sewer has never been completed, its present point of discharge being in the swamp at the foot of Robert street. Through its whole length the sewer passes

through low swampy land, usually at too high an elevation to be of much service in draining the land in its present condition. Large quantities of sand and refuse have been carried into the receiving basin at its upper end and thence into the sewer. This with the leakage of sand through imperfect joints has rendered the sewer inoperative above Court street. A late examination shows considerable settlement, broken pipe and much bad workmanship.

Three laterals enter this sewer,—first, a nine inch lateral running west from a point about 150 feet north of Ludington avenue with a length of 800 feet; second, a 12 inch pipe running east on Ludington avenue between Robert and Charles streets 660 feet in length, and third, a nine inch pipe running east on Loomis street 625 feet in length.

The next sewer to be described, has its outlet at the foot of James street, running thence north on James street 3,100 feet to Ludington avenue, thence east on Ludington avenue to Washington avenue 2,225 feet. This sewer is the outlet of an area covering about 240 acres in which is included the main business portion of the city. It has ample fall, but has caused considerable trouble and expense by its liability to clog up with sewage and sand. This, however, is nothing more than can be expected, the size of the pipe used having been planned for so large an area and at present carrying less than one-twentieth of its capacity. There is not enough flowage to render it self-cleansing. This difficulty could have been in part obviated by using egg shaped pipe and its cleansing may now be greatly facilitated by the use of flushing tanks. It has one lateral, that of Foster street, a nine inch pipe 1,650 feet in length, built for the purpose of receiving the sewage of the Union School building.

The third sewer to be mentioned has its point of discharge in Pere Marquette lake at the foot of Lavinia street. It is a 12 inch pipe about 800 feet in length and was built for the purpose of surface drainage.

About 800 feet of nine inch pipe has been laid at the foot of Pere Marquette street. It was built principally for surface drainage and discharges into Lake Michigan.

It will thus be seen that the sewerage system of this city is yet in its infancy, comprising as it does only two and one-half miles of sewer pipe built at a cost of $20,000.

It may be stated that house connections on the streets where the sewers have been constructed are not universal and that the rain-fall, except on the paved streets, is not conveyed into the sewers, owing to the rapidity with which it is taken up by the sandy soil. Without doubt, when the system shall have been extended and come into general use with a large increase of water service, the main sewers will be found to be self-cleansing and the service greatly improved. Taken as a whole the management of the sewer system in this city has been somewhat faulty and some grave mistakes have been made. There is no adequate arrangement for flushing or cleansing, nor for ventilation, except such as are afforded by means of leaky catch basins or through man-hole covers,—I might add through faulty constructed house drains. There is no inspector to see that proper connections are made with house drains, nor any record kept of such connections.

DISCUSSION OF THE SEWERAGE AND DRAINAGE OF LUDINGTON.

BY A. ARNOLD CLARK, LANSING, MICH.

In the animal kingdom perfection depends on the complexity of organization, on the extent to which the different parts are under the control of a central brain. There is a little water animal called the polyp. Cut a polyp into a dozen parts, and each part will live and become a separate polyp, because there is no organization,—the polyp is alike all over. But rise in the scale of animal existence until you come to man,—cut a man into a dozen parts and the man dies. The heart can not get along without the lungs, the heart and lungs can not get along without the brain.

So that city is highest in the scale of social organization where there is the greatest variety of function. It is with reason that we compare a great city to the human body, because every human body is really an inhabited world made up of an infinite number of infinitesimal cells struggling and fighting with one another yet working together turning the food which we eat into body tissue. Herbert Spencer says that those telegraph wires stretching from ocean to ocean carrying thought like the lightning are like the nerves which carry thought to and from the brain. We may compare the water-supply of a great city to the veins and arteries which carry blood pumped by the heart into all the branches of the body. So, no city is very high in the scale of social organization until it is provided with great intestines—with underground sewers for the removal of its waste.

When the sewers of the body are clogged and the functions are deranged, the result is headache and stagnation of all vital energy. So when a city allows its waste to stagnate in the soil, to pass by underground currents never intended for such a purpose from privies to wells, or to send its putrid breath back into houses and streets, the result too often is the sickness of the entire community, a condition of things which should not be tolerated by any civilized community.

The complete removal of all waste is as much the function and duty of the city as the lighting of its streets. I suppose that your taxes might be less if you dispensed with street lamps. I suppose that if every citizen were his own policeman it might seem less expensive, but street lights and a police force are the proper functions of the whole city and that city is way down in the polyp stage of existence which thinks that the removal of its waste can long be left with impunity to its individual citizens, which thinks that its soil can long continue honeycombed with vaults, cesspools and wells without that city receiving the punishment which is sure to follow the violation of physical law.

It needs no discussion, it admits of none, the privy vaults of Ludington, likely at any moment to receive the dejections of some typhoid fever patient and to carry the germs of that disease by these underground currents to some neighbor's well,—the privy vaults of Ludington are so many relics of barbarism, and your local board of health has it in its power to declare them nuisances and order them abated.

But what shall take their place? For villages and smaller cities, the dry earth closet is frequently recommended, and it has many advantages, but this

disadvantage: where this system is adopted, the removal of waste is usually left to individuals, and the proper removal of all waste is, as we have seen, the proper function of the whole city. Even when the city does the work, it is largely done by hand, and hand labor is not the usual attendant of a highly organized society.

I think it may be assumed without argument that the proper system for disposal of waste in Ludington is a sewerage system—a water-carriage system. There is the pneumatic system of sewerage which attempts to remove sewage by an air pump, but it is not necessary to discuss this system because of its great cost and because the water-carriage system is so well adapted to your city and our subject is the sewerage and drainage of Ludington.

This subject really embraces two subjects. By drainage we mean the disposal of the storm water or rain-water; by sewerage we mean the disposal of waste. The old-fashioned sewers were made big enough for both. You remember Victor Hugo's description of the sewers of Paris which were so large that Jean Valjean was able to pass through them upright with Marius on his back. The sewers of Rome were large enough for the Roman emperor to row a boat through them. It being necessary to accommodate the heaviest rainfall, in dry times the sewage flowing over so large a surface flows very slowly. This furnishes a good opportunity for the formation of sewer gas, and sometimes this sewer gas goes the wrong way. As Victor Hugo said: "This stomach of civilization frequently digested badly and the sewer flowed back into the throat of the city."

The damp walls of these drains became a good nidus for the microscopic germs of disease which also flowed back into the houses with the sewer gas. Other things not so microscopic were found there, such as bones and bottles, towels and stockings, spoons, potatoes, etc.

A great step was taken in sanitary progress when ten years ago Col. Waring recommended to the citizens of Memphis the adoption of what has since come to be known as the separate system of sewerage. This system had previously been introduced in England in an imperfect form, and its object is to remove by the sewers nothing but the sewage and to remove the storm water by other drains or to trust to natural drainage. This is the proper system for Ludington, where with your loose porous soil the storm water is easily disposed of by natural drainage. Where this is the case, the separate system costs only about one-fifth as much as the old system.

The citizens of Memphis were taught the necessity of a proper sewerage system by a great epidemic of yellow fever which cost that city in ten weeks five thousand lives. But that epidemic was just what the citizens of Memphis needed. Memphis was one of the dirtiest cities on the globe. At once the people of Memphis cleaned out their five thousand cess-pools, put in these small sewers recommended by Col. Waring,—ranging in size from 6 to 15 inches (with a main outlet sewer of 20 inches), with automatic flushing tanks filled every twenty-four hours and then discharging 150 gallons in less than a minute, with ventilating pipes running to the tops of the houses. No stoppages have occurred in the eight-inch sewers. The sewers run so nearly full that there is no chance for germs to grow on the walls or for sewer gas to form, the whole underground network moves with the regularity of clockwork, and since the introduction of this system the death-rate in Memphis has fallen off one-fifth.

If every human life is worth something to the State it paid the city of Memphis to spend a little money to introduce this sewerage system.

These sewers, remember, are not intended to carry off the storm water but only that waste represented by the water-supply. You see why we discuss water-supply and sewerage at the same time. As soon as a city has introduced a water-supply the next step is to introduce a system of sewerage. Not only does the removal of the sewage depend on the water-supply but sometimes the sewage furnishes the water-supply. I am informed that the citizens of Ludington send their sewage to the Pere Marquette river that this sewage flows down the Pere Marquette until it reaches the point where you take in your water-supply, suppose the germs of typhoid fever should find their way into your sewer, would your water-supply be safe?

You have heard of the contamination of wells by leachings from vaults, but how much more dangerous is it when the entire water-supply of a city becomes contaminated.

The people of Plymouth, Pa., suffered from an outbreak of typhoid fever a few years ago in which one citizen in every eight was sick. There were over one hundred deaths. Think of one hundred deaths from one disease in ten weeks in a city about the size of Ludington. Plymouth obtains its public water-supply from a mountain stream. The previous spring there had been one case of typhoid fever above the city at a considerable distance from the water-supply. The dejections from this patient were thrown without disinfection on the deep snow of a sidehill sloping toward this stream. In March of that year (1885) there was a thaw and the snow with the typhoid germs flowed into the stream and from the stream into the water-supply. Only those who used the public water-supply were affected. Suppose the germs of typhoid fever should find their way into your sewer and from that into the Pere Marquette, would you be safe in taking your water-supply from this same river. Suppose these germs should be drawn by the natural current into your water-supply, nothing would save you but boiled water, and how many citizens of Ludington take the precaution to boil all the water they drink.

However, if you would take your water-supply from the lake—far out in the lake, and from the right direction you could then continue your present sewer,—stretching out a branch in every direction so that the city of Ludington would have another Ludington of sewers beneath it, without danger to your water-supply, because you could probably depend on such a large body of water to oxidize the germs of disease before they found their way into your water-supply.

There is, of course, considerable objection to the pollution of the water of streams with sewage in any case. In some English cities the courts have prohibited the emptying of sewage into rivers.* You may remember the way in which Victor Hugo cries out against Paris emptying annually five million francs into the sea. "I assert it," he says, "without metaphor—five million golden francs by the wretched vomiting of its sewers." "We fit out convoys of ships," he says, "at great expense to gather up at the south pole the droppings of petrels and penguins and the incalcuable element of

*There are two general plans advocated for the purification of sewage: (1) The "intermittent downward filtration" system, setting aside an acre of ground drained six feet deep for every three or four thousand population, using one part and then another for the purification of sewage, the aim being to apply the largest possible amount of sewage to the smallest possible amount of land; and (2) the "irrigation system," the object of which is to utilize sewage for agricultural purposes, applying the smallest possible amount of sewage to the largest possible amount of land.

wealth which we have under our own hand we send to the sea"—"from this two results, the land impoverished, the water infected." Again he cries, speaking of the utilization of sewage for agricultural purposes: "What is this garbage, this subterranean slime? It is the flowing meadow, it is the green grass, * * * it is perfumed hay, it is golden corn, it is health, it is joy, it is life." But whether or not it might not become under certain circumstances disease and death, whether or not the germs of disease deposited upon the soil might not continue to live, be eaten by men and produce disease, just how far they would be destroyed by the scavenger germs of putrefaction, just how far they would be oxidized, are questions not yet definitely settled.

I do believe that the utilization of sewage with perfect safety will be one of the sanitary problems of the future, but at present the practical question is not so much how to utilize sewage as how to dispose of it in a sanitary manner, because a human life is of more value than manure, and we have accomplished a good deal when we have accomplished that.

Say what we will about the pollution of streams, the germs of disease stand a better chance of oxidation in these large bodies of water than they do in those underground currents communicating between our privies and our wells, and the fact remains that with the introduction of sewerage those diseases which owe their origin to a contaminated water-supply have steadily decreased. The death-rate from typhoid fever in London is today only one-fifth what it was before 1860, when the new sewerage works were introduced. The death-rate in Chicago has decreased nearly one-half since the introduction of the present sewerage system.

Think of the black death and those great plagues which in the middle ages nearly depopulated the nations of the earth. At the time of the black death the houses of Europe consisted of one room built of stone—no mortar, no window, no chimney, no pillows, no bed, no floor. The filth was left to accumulate on the ground where the inhabitants slept. When this filth became unbearable it was covered with a layer of rushes, and then with other layers. In the large cities it was not safe to pass along the streets at night for fear of being deluged by slops from the windows. It is said that the streets were often so narrow that people could shake hands from the windows of houses on opposite sides of the street. And when the black death swept over England only one in ten was left alive.

Even in the seventeenth century the average man only hoped to live to be twenty-four years old. Now he may live to be fifty, while scientists tell us that if we lived as we ought to live, that if we prevented those diseases which we now know enough to prevent, the average man should live to be one hundred years old.

Prof. Huxley says that that time is coming,—the time is coming when a friend meeting another in the street will as soon ask are you honest as are you well,—when a man will be as ashamed to be told that he looks sick as to be told that he looks like a thief.

The object of this Convention is to bring about that time; the object of these local boards of health is to prevent those diseases which we know enough to prevent, and one of the objects of this State Board of Health is to find the way of preventing others. And if all which a man has he will give for his life, surely that science is the highest, that art is noblest which prolongs the lives of millions and endows those lives with health and strength.

Prof. Delos Fall, member of the State Board of Health, being called upon, explained the action of disease germs. It was formerly thought that disease was some form of punishment for sin,—the work of evil spirits. In modern thought something stands in the place of those evil spirits,—it is these germs of disease—these minute organisms which multiply and feed on the system, and in some way produce disease. These germs can be seen by the microscope and their form can be made out. For example there is a specific germ known to produce typhoid fever. These germs finding their way into the sewer will find material for their propagation and thus multiply producing others. If a local board of health is active it will see to it that all dejections from the patient are disinfected. If this is not done and there is doubt about your water-supply, all the water you drink should be boiled, because boiling will destroy these germs of typhoid fever. You should take your supply as far out in the lake as possible. Chicago at first took water near the shore but later pushed farther out into the lake.

Henry B. Baker, M. D., secretary of the State Board of Health, being called upon, said that not all diseases could be attributed to bad water, but there are diseases which are directly traceable in this way. All should be interested in having a good water-supply. Both from the standpoint of expense and probable usefulness, the separate system of sewerage is the best. The disposal of ordinary water by surface drainage is perfectly easy in Ludington. Without a system of sewerage, where does your excreta go if not to your wells? It is to be hoped that these discussions will be continued after the sessions of this convention are over, that some one will prepare a diagram showing the relation of privies to wells, endeavoring to ascertain whether there is more sickness from typhoid fever among those who drink water from wells which are near privies than among those who have an uncontaminated water-supply. You should endeavor to purify your water-supply until Ludington is the most important summer resort in this part of the State.

THE CAUSATION AND PREVENTION OF CONSUMPTION.

BY GEO. HENRY CLEVELAND, M. D., PENTWATER.

To me has been allotted a brief consideration of the causation and prevention of consumption. I will not, therefore, step without these bounds to describe the disease. You know from close observation,—from almost daily witness,—the characteristic ravages of this affection. Nor will I enter into the treatment of consumption,—the most speculative field of medical thought.

It may not be surprising to learn that descriptions of consumption come down to us, hand in hand, with the earliest fragments of general history.

Hippocrates, in the fourth century B. C., very clearly wrote of consumption; and he held that it first occurred as a nasalcatarrh, the acrid discharge of which, descending from the head, produced ulceration of the lungs,—a

theory, you will recognize, similar to that commonly maintained by the laity of today.

Aretæus, in the second century, likewise fully understood the disease, and has left us his thoughts.

Galen, also, contemporary with Aretæus, and to whom, with Hippocrates, we still, in some respects, yield authority,—though the space between our eras is misty,—knew what consumption was. He met it, and studied its processes; and struggled, as we do now, with the hope of annihilating its power.

Other names come down the roll of eminent medical thinkers and investigators in this direction: *Alexander Trallian, Paulus Ægineta, Avicema, Forestus, Paracelsus, Oribasius, Aëtius, Capivaccius, Avenzoar,* and so on through the great family, until more recent times.

All during this great span of ages, two superlative efforts have occupied the attention of these earnest men, viz.: (1.) To find the true *cause* of the disease; and (2.) To find a specific *remedy* with which to thwart its ever onward progress.

The difference between the ancients and the moderns as to the etiology, or causation of consumption, is the discovery of the *bacillus tuberculosis.*

This bacillus, or germ of consumption, is an organic substance, only to be observed and distinguished by using very high microscopical power; and this element has now come to be so intimately associated with the pathological or diseased conditions of consumption, as to create the almost universal opinion that the disease is due to the action of this germ within the body, and particularly within the lungs.

But to go back of this,—but partial solution of the problem,—and ascertain what produces the germ; what conditions favor its introduction into the body; and how it gains access thereto; are still subjects of more or less conjecture and dispute.

One hundred years ago the opinions of the foremost writers touching upon the causation of consumption, were that it was caused somewhat as follows:

(1.) Catarrh of the head. (2.) Smoke from the wicks of candles, fat and oil when poured into a confined space and inhaled. (3.) Light clothing. (4.) An excess of animal food. (5.) Inactivity and full living. (6.) The morbid matters of venereal disease. (7.) The influence of cold climate. (8.) The advance, or rather, introduction of civilization, it being claimed that the disease was unknown to the North American Indians before they associated with white men, and was not found among the colonists in the earliest stage of civilization. (9.) The use of tea. (10.) The influence of gout; and (11.) it was remarked that hostlers and grooms, living in the alkaline air of the stable, were rarely consumptive.

Today, these views are somewhat modified; the modifications being based largely upon the recognition of the tubercle bacilli, or the parasite of consumption, as the potent factor in the morbid derangements.

Heredity, may be a medium for the propagation, if not the original entrance of the poison; that is, the disease may be transmitted from parent to offspring either by the direct descent of the poisonous principle itself, in a latent, or more or less active state; or by the transmission to the child of a distinctive type of tissue, which, in course of a varied space of time, will prove to be the nidus, or fertile field of growth and action, whenever the germ may enter.

Then again the particles may enter the lungs by the inhalation of dust which is loaded or infected with the bacilli.

The active element, or poison of this disease, is cast off from the patient mainly by means of the sputa, or expectoration; but the other bodily excretions may contain the principle. This poison may, if not rendered inert, enter your system by contaminated air; by food, particularly milk; by water; by the clothing; may be carried by ordinary house flies; may be communicated by the act of kissing.

To the praiseworthy exertions of the secretary of the Michigan State Board of Health, must credit be given for researches into various meteorological conditions,—particularly *cold*—as playing no small part in favoring the production of consumption.

So much for the *causation* of this disease; and though short of what may heartily be desired, yet very recent discoveries—permitted by the improved means of investigation and study at the disposal of our great searchers—are decidedly hopeful, and indicate that the human mind is not at rest. Advancement is the order of the day, and in all specific diseases, continual perseverance against their cause, will, I believe, in time, be rewarded with a conquest of their power.

PREVENTION.

A portrayal of what is known concerning the cause of this disease, and the avenues and means by which the virus is introduced into our bodies, suggests at the same time, and to a degree, the possible means of prevention. The grand preventive would be to totally eradicate or exterminate this microscopical element which appears to be responsible for the frightful havoc we so constantly see. At present, however, and until patient investigation can be rewarded by measures to be relied upon to destroy the *bacillus tuberculosis*, both previous to, and after, its entrance into the body; we must march on in the attitude of defense only.

Where any family predisposition exists, even though it be of slight degree, every effort should be made to preserve the normal state of bodily nutrition,—the standard of health.

A recognition of possible danger,—though not a morbid fear,—should urge on a pursuit of the known means of avoidance of those conditions which tend to favor the occurrence of consumption. Among those conditions may be mentioned,—any debilitating influence; scrofula in early life; continued dyspepsia; repeated catarrhs; tardy and incomplete convalescence from any fever or exhausting disease; indoor occupation of any kind, particularly where the position is stooping or confined; a general lack of sufficient physical exercise; deficient circulation of pure fresh air in apartments frequented for any length of time; general unsanitary surroundings, or some special unsanitary condition; the continued, or possibly occasional, inhalation of dust, grit, or metallic particles; and co-existent with any one or more of these conditions, will anxiety, imperfect food, and intemperance, but add fuel to the flames.

Particularly, and by all means of much importance is the avoidance of direct contagion. If you have an hereditary tendency to consumption, you should keep away, as much as is within your power, from immediate contact with a consumptive person. I believe the contagiousness of phthisis is

becoming daily more evident. Whole families are afflicted, and one member will follow another with a certainty that can almost be measured. The old and oft-repeated adage about the "ounce of prevention," and "pound of cure," could be no more strikingly applied than in an hereditarily predisposed individual possessing a due recognition of his dangers.

A rigid following of the general and known laws of health; the keeping of the bodily demands and requirements in regular order; the maintenance of the standard of vital force; are all powerful and important factors in reducing the susceptibility, and diverting a possible proneness to this frightful disease.

"What," you may ask, "if I have no known hereditary tendency?"

Then—I answer—you should none the less be vigilant over the body given to your care:—for even without a predisposition of this nature, you still have no reason to believe you may not fall a victim to the insidious workings of the parasite of this affection. Do not wait until the tell-tale evidences:—a slight morning cough; occasional hoarseness; frequent pulse; diminution of vigor; loss of flesh; shortness of breath; and slight spitting of blood; come upon you, and warn you of the approaching monster. But be on your guard against a doom that may come to your door,—(1.) by an understanding of the laws and processes which constantly threaten (2.) by the continual payment of the premium of eternal vigilance, thereby securing the highest insurance within your power.

DISCUSSION.

Henry B. Baker, M. D., Secretary of the State Board of Health, spoke of the importance of the discussion of this subject, consumption causing more deaths than any other disease,—and of the importance of thoroughly understanding that consumption is a communicable and preventable disease.

A. Arnold Clark, of Lansing, described the germ which Koch had proved to be the cause of consumption, and how the disease is usually produced by the inhalation of this germ or bacillus from the dried sputa of consumptive patients. He spoke of the experiments where consumption in animals had followed inoculation with the specific germs. He also gave one or two instances where consumption was known to have been communicated from person to person.

Hon. John Avery, M. D., president of the State Board of Health, said that probably none of us went through life without at some time inhaling the germs of consumption, but they do not always find a favorable soil for their growth. By experiments it has been shown that rabbits or guinea pigs inoculated with the germs of the disease and placed in the open air with plenty of good food would not die with the disease, while other rabbits or guinea pigs inoculated at the same time and placed under unfavorable surroundings died. Intelligent physicians now advise for consumptives exercise in the open air, and a climate where this is possible. It is a fact that some are more liable to the disease than others.

Question: In case the lungs are once thoroughly inoculated, can the germs be eradicated?

Dr. Avery: I believe that there are many cases in which the cavities of the lungs heal and consumption is cured.

Prof. Delos Fall, member of the State Board of Health, spoke of the germ as a seed. You plant the seed of consumption and you get consumption.

provided the soil is good. The soil for the growth of plants is better in some places than in others.

Arthur Hazlewood, M. D., member of the State Board of Health, said if consumption was hereditary, it is mostly because of a weakened constitution. Whatever the hereditary tendency may be, by a judicious course of life you may ward off the disease.

Dr. James A. King, of Manistee, thought that consumptives should not marry. However there might be an acquired susceptibility as well as one which was hereditary.

Dr. P. P. Shorts, Ludington, thought the fact of there being an acquired susceptibility should be emphasized. Unsanitary conditions may predispose us.

Henry B. Baker, M. D., secretary of the State Board of Health, said that from the meteorological statistics collected by the State Board of Health it was found that diseases of the air-passages are more prevalent after cold weather than after warm weather. There are twice as many deaths from small-pox in the spring as after the warm weather, and this is true of the other communicable diseases which enter the body through the lungs and air-passages. It is also true of such diseases as influenza and pneumonia. One way to prevent consumption is to avoid breathing cold air. Consumption follows after those other cold-weather diseases, such as tonsilitis and bronchitis. By exposure to cold the patient gets tonsilitis,—he then comes into a room where Koch's bacilli are present as dust in the air, and he gets consumption.

Rev. I. W. McKeever asked whether the consumption of other organs was the same as pulmonary consumption.

Dr. Baker replied that pure cultures from "consumption" or tuberculosis in other parts of the body show the presence of the same germs or bacilli as do those from tuberculosis of the lungs. Although the disease *usually* enters by the air-passages, there is danger in using for food the flesh of animals affected with consumption, or the milk of cows which have the disease in the organs which produce the milk.

THE PRESENT AND FUTURE METHODS OF DISPOSAL OF WASTE AND EXCRETA IN LUDINGTON.

BY F. W. GRAHAM, M. D., LUDINGTON.

This subject you will all recognize as an unsavory one. I am to tell you about the disposal of waste matter, and first let us consider how it is usually disposed of. The back yard, in the majority of cases, becomes the depository of all sorts of things that are filthy and decomposable, and in many cases the cause of disease. How do they become the source of disease? First, by their decaying, which virtually is a hot bed for the various disease germs, viz.: Diphtheria, typhoid fever, and in fact similar germs may, and many times are the source of many other diseases. These germs do not do us very much harm when we are well, unless they come upon us in very great numbers; but when we are debilitated from any cause, then, if present, they pounce upon us and undertake to devour us. It is important also that we do

not take cold and have a sore throat, or that there should be no germs of diphtheria around when we get a sore throat,—that is, a raw throat. If the mucous membranes are broken, those germs that can get in may pass through the raw sore throat into the tissues; if they do not get into the tissues they can do no harm, but if they do get in they may do great mischief, for they multiply enormously. In a very few days the descendants of two or three, may outnumber the whole population of the globe. The above remarks will serve to illustrate the necessity of keeping the waste or garbage of the house from accumulating, decaying and generating these disease germs.

The question now to be considered is the most practical way of disposing of this material. One thing can be done with it. It can be burned. Although it does not make the best of fuel, it will burn as well as green wood, and causes no harm. After the fire is started it can be put in the back part of the fire-box of the stove and, before we are aware of it, it is entirely consumed.

There is a devise in use in some families which prepares this material very nicely. It consists of two sheet-iron cylinders,—one inside of, and a little shorter than the outside one. The outer one is made to fit in the griddle hole of the stove; it has a tight cover, and is open at the bottom. The inner one has a tight bottom, but is made so that it will tilt and spill the contents of its cylinder. By placing the waste material in the inner cylinder and when the fire is burning, place the two over one of the griddle holes, the heat causes an evaporation of the fluids which rise in steam. Being unable to escape at the top on account of the tight cover on the outer cylinder it passes down between the two, and is drawn into the fire and consumed, or passed out with the smoke in a superheated condition so that all germs that it may have contained are killed and can do no harm. After the moisture has all escaped, the bottom of the inner cylinder is tilted and this allows the contents to drop on the fire, when they are readily consumed. This I believe to be the most useful and practical way of disposing of garbage or waste of the household.

We will now consider the disposal of excreta. It is hardly necessary to describe the privy pit system, if indeed we should apply the term system to such a crude device as an excavation in the earth for the reception of and storing of filth. It requires but slight knowledge of the system, and of the nature of our porous soil and shallow wells to condemn it entirely. Sand, as we all are aware, being a very poor filter, it offers but slight obstruction to the fluids from the cess-pools entering the wells, which many times are in close proximity to them. In the privy vault a slight improvement could be made, by placing in the pit or excavation a water-tight cask, tank, or receptacle, made of cement, masonry or other material. By these means it is intended to prevent soaking the soil with filth. In places where these pits and vaults are allowed to exist removal is effected in various ways, the most primitive being by carts, sometimes with a layer of ashes or earth spread over the night soil; in other places by means of some form of odorless excavator, which by all means is the best.

Another method and form of disposal, which has been used in places to some extent is the dry earth or ash closet, which like the rest, has its disadvantages, although it is spoken of in decidedly favorable terms, in comparison with the old midden or privy, over which it certainly possesses many advantages. For instance, the receptacles being small they must necessarily

be frequently emptied, once a week, or oftener, thus avoiding the large accumulation and long retention which are so objectionable. They are above instead of in the ground; they obviate, when in good order, pollution of the soil, and from their situation under cover they receive no rain, their greater dryness protecting their contents from rapid putrefactive changes. If instead of ashes being used as the absorbent, dried earth be employed, we have what is called the earth closet; it has the recommendation of being based on nature's own method of deodorization, and the principle is no doubt absolutely perfect. The application of the principle, however, is quite a different matter. It is one thing to take the excrement to the soil, but it is a totally different one to bring the soil to the excrement. It is manifestly impossible to employ earth for the deodorization of excrement in large towns; it may answer very well in detached houses with gardens, or even for small villages, but for larger populations it can be proved at once that the plan is not feasible. It has been shown by experiment that 4½ pounds of earth per head per day is required for the purpose, so that for a town having 8,000 persons 36,000 pounds would be required every day. This earth must be of the right kind, viz.: more or less of an argillaceous or clayey character. Sand is of very little value. It must be sifted and dried, and brought from the country into town and taken back, preserved from damp, and thrown upon each dejection at once and in proper quantity. These proceedings would involve such an amount of labor, expense, and care as place the method entirely beyond the range of practical application. Earth closets, moreover, are not safe inside of houses, owing to the impossibility at all times of insuring complete deodorization.

It remains to say a few words about the water-carriage system of sewage disposal. The channels by which this water-carriage is effected are the sewers, for sewers are indispensable in all cases. It possesses one advantage over all others which entitles it to our unhesitating acceptance, namely, its immediate removal of excreta or other filth deposited in it. The first consideration with us must be its sanitary bearing, and I think no one will be found to question the view that retention in our midst of excretal and other forms of filth until they become putrid, or even for a moment longer than necessary, is a violation of natural law, and is practically fraught with the greatest injury to health. We have few opportunities here for a thorough system of sewerage and water-carriage. Having an unlimited supply of water, and an easy way of discharge from the sewers, I believe it to be only a matter of a few years at most before our city will have a thorough system of this kind. I further believe that the water-carriage system is preferable to every other on the grounds of convenience, health and economy. I feel that I have treated the comprehensive subject of my address very imperfectly and very incompletely, but I trust that it will attract the attention its importance deserves, and result in some practical advantage.

DISCUSSION OF THE DISPOSAL OF WASTE AND EXCRETA IN LUDINGTON.

Arthur Hazlewood, M. D., member of the State Board of Health Grand Rapids, Mich., said that there could be no question but that in the nomadic

tribes of years ago, the earth closet was a good institution. In Ludington with a fixed population and with such a porous soil this system might soon be a great offense. Situated as you are you can adopt the best system of all,—a water-carriage system, and the separate system is the best one to adopt.

During the discussion last evening he was reminded of his own experience in 1866 and 1867 when he practiced in Memphis. In a certain portion of the city, occupied by squatters, ditch water was used for drinking purposes. When the cholera came the negroes thought that they were being poisoned by their former masters, but they were their own poisoners. So are you with your porous soil if you do not properly take care of your own excretions. It is hardly possible for you living here, in case of typhoid fever or cholera making its appearance, to hinder a severe epidemic so long as you make a common cess-pool of the soil and allow nature's washings to carry the contamination to your wells.

There are other forms of waste than excreta, and here the Mosaic law applies. There should be a huge bonfire outside the camp. Or in the absence of the bonfire the refuse should be destroyed in the kitchen stove.

In response to a question as to what depth the surface water would extend, Dr. Hazlewood said that it depended entirely on the soil. If the well is dug below the general surface of the water the chances of contamination are lessened.

In response to a question as to the utility of filters, Dr. Baker said that too often the use of a filter only tended to increase the danger in the use of infected water. He spoke of the outbreak of typhoid fever in Providence, R. I., in November and December, 1888, where a bacteriological examination of several domestic filters used by families where typhoid fever had prevailed, showed not only the typhoid bacilli but several other micro-organisms indicating fæcal contamination of the water. After filters have been used continually, water from them may teem with bacteria, although only a few may be found in the water before it is filtered.

Dr. James A. King, of Manistee, said that he was interested in the objections to the dry-earth system, but still this system is infinitely better than a vault. For a long time many will not connect with a sewer, and it will be found easier to establish a dry-earth system. In Manistee the sewers are simply elongated cesspools, only ventilated through the houses of the people. If a sewerage system is adopted in Ludington it should be a good one, with sewers thoroughly trapped and ventilated. He also wished to emphasize the importance of burning garbage.

Dr. John Avery, President of the State Board of Health, in response to a question as to the value of ashes as a deodorizer, said that coal ashes would answer the purpose very well instead of clay. It is not necessary to buy a costly dry-earth closet. A cement closet is cheaper than a pit. Clay is good, and can easily be procured in most localities. However, no system is practicable for a large city unless it is under somebody's supervision. All towns

are not so favorably situated as Ludington, with such a great lake into which they can sewer.

Prof. Delos Fall, member of the State Board of Health, said that he had found the dry-earth closet very practicable; in fact there was nothing offensive about it; it was harmless and odorless.

Dr. Hazlewood favored sewerage because it was better adapted, and because ashes are not used in Ludington and there is no suitable dirt, sand not being good for the purpose.

Dr. P. P. Shorts said that the present system of sewerage in Ludington was a nuisance. The water supply is likely at any moment to become contaminated. Filters will not last. Boiling the water is the only safeguard, under present circumstances.

A. Arnold Clark, Lansing, called attention to the fact that when fruit was canned it was boiled to destroy the germs of fermentation. As the germs of fermentation once introduced into the fruit make the fruit ferment, in something the same way the germs of typhoid fever in the water will make a well man sick with that disease, and as boiling the fruit will destroy the germs of fermentation and save the fruit, just so surely boiling all drinking water will destroy the germs of typhoid fever and save an epidemic.

Fourth Session—Friday, July 12, at 8 P. M.

The fourth session of the Convention was called to order by Dr. A. P. McConnell. The firstpaper was by Dr. G. W. Crosby, Ludington, on the "Restriction and Prevention of Diphtheria."

RESTRICTION AND PREVENTION OF DIPHTHERIA.

BY G. W. CROSBY, M. D., LUDINGTON.

The restriction and prevention of a disease as destructive to life as diphtheria ought to interest us all sufficiently to stimulate us to acquire whatever knowledge upon the subject we can. There is no one word the doctor can utter, that will quicker strike terror to the heart of a fond mother or father, or sooner blanch with fear the face of an older sister or brother than the one word—diphtheria. And I can assure you, ladies and gentlemen, there is no diagnosis at which the average physician arrives with more care and deliberation, for he well knows the responsibility involved should he mistake his enemy, yet he hesitates to unnecessarily alarm the family and neighborhood.

But when brought face to face with this dreadful disease in its worst form, when obliged to stand at the bedside, an almost helpless observer, and see the little patient rapidly succumb, notwithstanding all his efforts to combat the disease, when the pinched and anxious expression, the dull, heavy eye, the weak, rapid pulse, the heaving, difficult respiration, and the extreme prostration so rapidly take the place of health and vigor; and finally in the last agonies of death from suffocation, when the little child, with almost superhuman strength, will spring from the pillow in its wild efforts, gasping for breath, it is enough to stir within one's soul a determination to conquer by some other means than those which are only begun when it is already too late.

Only a few of us can do a little to cure diphtheria, all of us can do something to prevent it.

The restriction and prevention is therefore of vastly more importance than the treatment.

How are we to accomplish the prevention? As yet our knowledge of the cause of diphtheria is so limited that the study of how to prevent it is necessarily somewhat unsatisfactory. Yet there are a few rules and principles which if well understood and thoroughly carried out, aid greatly in its prevention. First of all come the general laws of sanitation and hygiene, which have a powerful influence in warding off disease of any form, but more especially those of an epidemic or contagious nature. Although it is not proved that sewer gas, poorly ventilated and filthy rooms, bad drainage or damp cellars will generate the diphtheritic poison, it is known that such conditions are very favorable to the development and multiplication of those germs. Therefore the more perfect the plumbing and sewerage is in any city the less will be the liability to severe outbreaks.

All influences which have a tendency to produce sore throat, or in any way debilitate the system, render a person more susceptible to the disease. Such influences should be more especially avoided during an epidemic of diphtheria. But until the cause of diphtheria is more positively known, we cannot lay down definite rules for its complete prevention.

The restriction of the spread of the disease is quite another matter, and one which we can to a very great extent control.

By perfect isolation of the patient in a room, void of all unnecessary articles of furniture, by afterwards burning or disinfecting all clothing, and by thorough fumigation of all rooms in the house from cellar to garret, as well as all outbuildings about the premises, the spread of the disease may be positively stopped.

It is necessary that the disinfection and fumigation should be carried on under the direct supervision of one who thoroughly understands it, for the sprinkling of a little carbolic acid about the room, blowing a little sulphur down a patient's throat, or sprinkling a little upon a stove in an occupied room will have about as much effect in checking diphtheria as it would in stopping a Kansas cyclone.

You may ask why we do not do so if we can stop it so easily? A great deal has been accomplished in this line as you will readily see when you follow me over a few figures. And a great deal more will be accomplished when the people learn to co-operate with the board of health in carrying out these measures. It is quite surprising at times to see how indifferent some people are in following out instructions when it is all done for their own interests. It is with a great deal of pleasure that I can state that during thirty months'

service as health officer of this city, I have met but very little resistance in carrying out regulations. But the residents of Ludington have learned by bitter experience in years past, the importance of such regulations.

If you will kindly follow me a moment I will present a few figures which will show you the grand work being done by our own State Board of Health, in the annual saving of life from diphtheria, by enforcing the simple rules of isolation and disinfection.

In 1887 there were reported 398 outbreaks of diphtheria in which there were 2,321 cases and 561 deaths, making an average of 5.83 cases and 1.41 deaths per outbreak. In 202 outbreaks where isolation or disinfection were not mentioned, or the statements were of doubtful meaning, there were 732 cases and 190 deaths, making an average of 3.62 cases and .94 deaths per outbreak. Also in 118 outbreaks in which isolation or disinfection or both were neglected there were 1,391 cases and 320 deaths, averaging 11.79 cases and 2.71 deaths per outbreak, while in 78 outbreaks in which isolation and disinfection were both enforced there were 198 cases and 51 deaths, or an average of only 2.54 cases and .65 deaths per outbreak, indicating a saving of 9.25 cases and 2.06 lives per outbreak, or 721 cases and 161 lives in the 78 outbreaks, by isolation and disinfection.

Furthermore, if in all the 398 outbreaks there had been no restrictive efforts, and the averages had remained the same as in the 118 outbreaks in which we know isolation or disinfection was neglected, the total cases would have been 4,692 and the deaths would have been 1,079.

Deducting the cases (2,321) and the deaths (561) which really occurred despite all the restrictive measures, and there is indicated a saving of 2,371 cases and 518 lives by these measures.

DISCUSSION.

Hon. John Avery, M. D., President of the State Board of Health, in the discussion of this subject said:

Every community in Michigan is interested in this subject. It should be emphasized that diphtheria is a contagious disease. Everyone has a wholesome dread of small-pox, no one would think of entering a room where there is a case of small-pox, and yet there should be ten times the dread of diphtheria, because ten times as many die from diphtheria as from small-pox, and so we should emphasize the fact that diphtheria is a fatal, loathsome, contagious disease. Diphtheria will not make its appearance in a community until the seeds are brought in. If small-pox comes in your midst you at once investigate as to the cause, but the difficulty in restricting diphtheria is that people don't appreciate its contagiousness. One of the objects of these conventions is to educate the people that it is just as important to avoid the contagion of these more common and fatal diseases, diphtheria and scarlet fever, as of small-pox which many have already learned to fear.

It should also be understood that the mild cases of diphtheria often communicate the disease in a severe form. It is therefore necessary to isolate every case of suspected diphtheria. The germ of diphtheria will produce the disease every time it is introduced into a susceptible constitution, and all discharges containing the germs of the disease,—the discharges from the throat and nostrils—should be received on cloths and burned at once.

Every room in which there has been a case of diphtheria should be thor-

oughly disinfected after death or recovery with the fumes of burning sulphur that these germs may be destroyed.

In response to a statement that twenty years ago, when people did not recognize the contagiousness of diphtheria, cases were not isolated and yet no other cases occurred, Dr. Avery said that twenty years ago very little intelligent effort was ever made to trace a case of diphtheria to its origin, or perhaps no children might have come in contact with the disease.

In reply to a question as to the possibility of a return of the disease in the same person, Dr. Avery said that there was no absolute proof that one attack protects against a second. Children have diphtheria twice; indeed a man who has had small-pox may afterwards have varioloid.

THE DUTIES OF THE LOCAL HEALTH OFFICER AND THE RELATIONS OF THE PEOPLE TO THE LOCAL HEALTH OFFICER.

BY JAMES A. KING, M. D., MANISTEE.

As defined by the statutes of the State, the duties of the health officer are very plain and explicit, perhaps all the more so because the lawyers had the aid of a physician in their drafting. All of you have read them, or can read them for yourselves, and I shall not take time to make more than a brief summary of some of their principal points.

The health officer is required to report diseases dangerous to the public health promptly to the Secretary of the State Board. As executive officer of the local board he shall take immediate steps to control and prevent the spread of the same, by investigation, isolation, and disinfection. He shall have a general supervision over the sanitary conditions of his precinct. To the casual observer, these laws relative to the duties of the health officer may not seem very arduous, but to the conscientious health officer these innocent looking regulations seem burdened with suggestions of hard work, and, alas! too often, are redolent of too little, or no pay.

The law requires the health officer to placard the houses of those sick with a contagious disease. It is a simple matter to nail up a placard. It is quite another matter if the householder considers it an unpardonable offense, for which the officer should be boycotted. Isolation is often considered an outrage only to be submitted to under protest, after bitterly denouncing the law and officers, and especially the health officer, and then only to be observed in such a way as seems most agreeable and convenient; which amounts practically to no observance whatever. I have known of a man walking into a store to inquire "What's good for the small-pox?" Investigation revealed the fact that he had four children down with the disease, and the father had economically brought home the clothes of a son dying of small-pox and distributed them among his family.

Disinfection is often considered a great bother and nuisance, and last, but not least, a damage to property. I once knew a family who insisted upon removing a rag carpet from the room because sulphur fumes might injure

its colors. They sold the house shortly after, carpet and all, and the purchaser bought disease with the furniture, as the boarding-house keeper sold mice in the soup—without extra charge.

But these duties of the health officer,—isolation, disinfection, etc.—are the very least of his labors. Our zealous and methodical Secretary, Dr. Baker, has prepared blank forms for reports, and sends out printed circulars, pamphlets, etc., to meet any contingency, making the work of preventing the spread of contagious diseases comparatively easy. The instructions of the State Board make every duty so plain that only the minimum amount of work is required of the health officer in that direction. Indeed, most of the work has been done for him.

But it is in the general supervision of the sanitary condition of his locality that the most difficult problem is presented to the health officer. In towns having no regularly appointed inspector of public works, he should understand architecture, plumbing, and sewerage, foods and their adulterations. He should understand thoroughly the public and private water-supply, the dangers of, and the means of guarding against, its contamination. He should be a diplomate that he may lobby ordinances necessary for the guardianship of public health, through a conservative and perhaps somewhat obtuse city council, ever more eager may be, like Dickens "circumlocution office," to discover the several ways of "how not to do it," rather than the one best way of "how to do it." He should possess an eye as sharp as a Pinkerton detective's and an appreciative olfactory. If not possessed of Sullivan-like capabilities of self-defense he must have a "low, sweet voice" to use as occasion requires—a "pleasant thing" too, as well as "in woman." He should be blessed with a ready wit, a suave as well as polite manner, and a sunny smile. This last is especially necessary and should be under perfect control. Thus armed and equipped he wades through the mire of alleys, or back yards, "bobs up serenely" from dank and murky cellars, where, as Dick Swiveller said "the floor is—if I may be allowed the expression— sloppy." He appears unexpectedly at the rear door of stores, or kitchens, is a prey to vicious bull dogs and sometimes, though not often if he wears his smile correctly, is the object of a scolding tongue.

He should understand architecture that he may see any defect in the construction, ventilation, etc., of buildings, especially in our public schools where the coming generation are supposed to spend the greater part of twelve years of early life. Jails, churches and private dwellings should also come in for a share of his attention. He should understand plumbing that he may know if sinks, water-closets, etc., are well built and all their connections properly made, the pipes well calked, trapped and ventilated. He should understand sewerage, for, as some one has said, a "badly constructed sewer constitutes an elongated cesspool." God forbid that we do anything to elongate our cesspools! On a street in Manistee we have a sewer constructed without any provision for ventilation whatever. The man-holes are put in with solid heads (as are many of those in Ludington) and the house laterals laid without suitable traps or ventilation. The houses having water-closets are, uniformily, I believe, furnished with the old pan closet, unventilated and insufficiently trapped. Is it strange that I have to add that every house having sewer connection has had one or more cases of typhoid fever? Grim death and wasting disease, scourging with unrelenting cruelty,

have taught our city a lesson and at last have aroused our people to some sense of their dangerous surroundings. It is my earnest wish that Ludington may learn by milder means. You have had diphtheria, and while that may not have been caused by defective sewerage, its mention may suggest to many of you the accompanying horrors of a fatal epidemic.

Then do not rest content to live on, saturating your soil, largely sawdust and made earth, with germ-bearing filth and contaminating your wells with the contents of cesspools. The underground vault is a sworn partner of death, and the number in your city bears a direct ratio to the number in your grave yards. Then as sanitarians, paint upon your banner this motto, that in matters of health "cleanliness is next to"—nothing, but first of all. Then the hearse with its sad procession will wend its solemn way through your city's streets less frequently. The mother's cares will grow lighter, the father's purse heavier; while physicians will avoid your too salubrious city and seek some less favored people, where filth breeds pestilence, and disease stalks unchallenged in their midst.

Appoint a sanitary inspector or make your health officer one, see that he understands his business, send him to the State Board of Health for examination, and pay enough to obtain first-class talent. Manistee has paid $400 to her health officer in the last two years and about $60,000 to the typhoid bacillus and other similar creatures bearing a hard name. Had they paid $5,000 to the health officer, I have no doubt $400 would have footed the bill of the bacilli, nearly saving the cost of the whole sewerage system of the city. It is a pitiable and contemptible sight to see a wealthy city trying to *sponge* the services of its health officer. "Nothing, viewed in the light of raw material," is a very poor thing out of which to prepare the food of even a health officer and his family. He will fare better out of the proceeds of one prescription a day than on the average health officer's salary. Consequently he is obliged to stay in his office and bestir himself in his professional duties to the detriment of the health service, well knowing that if he does not do so the dread disease famine will fasten its claws on him. Is it the emoluments of office, I wonder, that the council, considers a sufficient compensation to the health officer? Is it so exalting to his station to wade through a slimy, slop-watered alley, or to trace up the sources, of some of those odors which were wafted on the balmy air as I came here to-night?

> "Is it physical
> To walk unbraced and suck up the humors
> Of the dank morning?
> To dare the vile contagium of the night,
> And tempt the rheumy and unpurged air?"—MACBETH.

If not, then surely the health officer should be paid at least as well as for the same time spent in the regular practice of his profession. I have a great confidence in the sense of justice of the people of Ludington. I do not know what you pay your health officer. The fact is I have purposely avoided finding out, for fear this protest might not be applicable to this city. If inapplicable, so much the better. At least there are many cities to which it would apply very well, in some of which this paper may be read. I should not object if the common council of Manistee read it. The relation of the people to their health officer should resemble that existing between a hive of bees and their queen, all working together harmoniously for the attainment of the same grand end.

The health officer receives his instructions from the State Board and of course understands his duty. I have therefore dwelt mostly upon the duties of the people to him. To attain anything like perfect sanitary conditions each individual must be a sanitarian, in an intelligent and active sense. The health officer can see that no spoiled meats, vegetables or fruits are sold, but he cannot follow them to your homes and superintend their preparation for your tables, nor fish their remains from your cupboards if left there, a miscellaneous mouldy mass, to generate disease. He may protect the people from the adulterations of an unscrupulous milkman, but if the milk stands in the sun, or is fed out of a half washed bottle he cannot protect the babe from cholera infantum. He may labor for the sale of only pure, fresh butter, but if the housekeeper places it near a codfish and a pail of rancid lard his labor will be for naught. He can oblige you to keep a clean yard, but he cannot clean your wood-box, scrub your floors, burn your dish-rags, clean the cellar, bathe your bodies, paper the walls, take up the carpets, air the beds, or raise the curtains and let in the life-renewing, health-giving sunlight of God.

I know there is a class who consider that any interference with their habits or occupations is a trespass upon their personal liberty. Goaded to madness by oppression and the pinching hand of never ending poverty, smarting under the injustice of wrongs inflicted by unwise legislation and the greed of trusts and syndicates, they complain in the words of the ancient Romans that you "repeal daily any wholesome act established against the rich and provide more piercing statutes daily to chain up and restrain the poor." Clamoring against the selfishness of others they would match it with equal selfishness of their own; loud in their protests against unnatural restrictions they overlook the natural restraint God expects from all; forgetting the grand law of universal brotherhood, they demand for every individual the right to "go as he pleases;" and confounding personal liberty with personal license, they would defeat their own objects by throwing off all restraint and allowing everyone to live as though the world were made for him alone. If we lived as of old, when every man furnished his own food, made his own clothes, built his own house and defended his own property and life, we could largely shift the responsibility of our neighbor's acts from our own shoulders, but now, when our common interests are so interwoven we must accept the grand ideal planned by an Omnipotent Father and face the responsibilities of common brotherhood among men. That indefinite line, where the personal liberties of one man must be restrained before they menace the rights, or health, of the community we should ever shun to cross, as would the prisoner of war shun the "dead line" at Andersonville. We should feel under the same moral obligation to avoid being tempted to commit such a wrong that we would feel if tempted to commit an arson or a murder. Such sentiments can only be popularly inculcated by thorough education of the masses. The city council should give time and hard study to health regulations and the best sanitary systems now in use. The enactment of wise ordinances of infinite assistance to the health officer will follow. The sanitary conditions of the city should be under the daily surveillance of a competent health officer whose word should be law, and meetings of this character should be held frequently. The increase in longevity and the decrease of disease, that would result, would be apparent to all, and the fact be demonstrated that sickness was not the result of infinite cruelty but of finite carelessness.

THE DUTIES OF THE LOCAL HEALTH OFFICER, AND THE RELATIONS OF THE PEOPLE TO THE LOCAL HEALTH OFFICER.

OPENING OF THE DISCUSSION, BY HENRY B. BAKER, M. D.

I think all will admit that the most important "duties of the local health officer," are those for the protection of the people, within his jurisdiction, from the most dangerous diseases. So that in order to know just what diseases he is to guard us from, we need to know just what are the most dangerous diseases.

In Michigan the five diseases which cause the most deaths are: consumption, diphtheria, pneumonia, typhoid fever and scarlet fever. Health officers are coming to believe that all of these diseases are preventable.

I take it for granted that your health officer does not need any instructions as to his duty; but I also take it for granted that he *does* need the support and coöperation of all good citizens in order to accomplish what is to be accomplished,—your protection from the most dangerous diseases. I suppose most people, if called upon to name the most dangerous diseases would say: "small-pox and cholera," but you will notice that neither of these diseases is mentioned as one of the most dangerous in Michigan. Whooping-cough causes more deaths in Michigan than does small-pox or cholera—more even than both of these diseases; and if every citizen would coöperate with the health authorities many lives might be saved from whooping-cough; but I shall confine my remarks mainly to diseases even more dangerous than that.

DIPHTHERIA.

Concerning diphtheria, which is next to the most fatal disease, health officers in Michigan now generally know how to restrict it, and thereby to save hundreds of lives. If you ask how do we know that they know how, I reply, some of the health officers in Michigan are doing this all the time, and we have the facts to prove it; and to prove how it is done. For instance in 1886, 464 outbreaks of diphtheria were reported to the office of the State Board of Health, and the health officers were requested to report just what was done to restrict the disease, and how many cases occurred in each outbreak. In about 200 outbreaks they did report distinctly, and of these about one-half had secured isolation of the first cases, and the thorough disinfection of infected things, while the other half had not secured both isolation and disinfection, although some of them had secured one or the other of these important measures. Careful compilation of all of these reports showed that in those outbreaks in which either isolation of the sick, or disinfection of infected places and things had been neglected, the disease had spread so that there were about five times as many cases and five times as many deaths as there were in those outbreaks in which both isolation of the sick and infected, and the disinfection of all infected places and things had been accomplished. In the 116 outbreaks in which all this was done there was apparently a saving of about *300 lives* and *1,500 cases of sickness from diphtheria.* Of course it is easy to find fault, and to say: "What a pity these

measures were not carried out in all of the 461 outbreaks instead of only in the 116," but we should not lose sight of the fact that there was a positive saving of several hundred lives, in a single year, from one disease, and that the compilation of the reports proved how it was done and how it might be done again, namely, by thorough and careful isolation and disinfection under the direction of a capable and efficient health officer. Very much the same thing was done again, as was shown by the compilation of the reports of the health officers in Michigan for the year 1887. And the compilation for the year 1888 has again shown similar results.

SCARLET FEVER.

What I have said relative to diphtheria is applicable, with slight variation, to scarlet fever. The compilations of the reports of the health officers in Michigan relative to scarlet fever during the year 1886, showed that in the 58 outbreaks in which disinfection and isolation had been thorough, the disease had not spread much, while in those outbreaks in which isolation or disinfection had been neglected, there were over five times as many cases and over five times as many deaths. The compilations of reports relative to scarlet fever in Michigan during the years 1887 and 1888, have demonstrated that the year 1886 was not exceptional, and the saving of life and health was apparent in both the succeeding years.

LIVES MAY BE SAVED IN LUDINGTON, AND MONEY TOO.

The population of Ludington is about eight thousand. If its death-rate is about the average, the annual deaths number about one hundred and thirty-six. Then about sixteen of these are from consumption, about nine from diphtheria, about four from scarlet fever, and about four from typhoid fever. These numbers may not be exactly true for last year, or for any single year, but for a long series of years they are an approximately true average. (If any of you hold in mind the deaths which have actually occurred in Ludington in years past, you may notice that they were not as many as I have mentioned, but you will also remember that the population of Ludington in those years was not what I now allow.)

From the experience of the health officers in Michigan during the years 1886 and 1887, I have demonstrated that at least 80 per cent of the cases of the sickness, and 78 per cent of the deaths from diphtheria are prevented by those who secure, after the first case has occurred, complete and thorough isolation and disinfection, such as an efficient health officer can secure when his people co-operate with him for that purpose. Therefore the lives of at least seven persons in Ludington can be saved each year that the disease is brought here, from that dreadful disease diphtheria. There may be years when diphtheria may not come to Ludington, and then some parsimonious grumbler might wish to cut down the salary of the health officer, perhaps after the same health officer had in some way prevented the first case being brought in, as, for instance, by preventing a public funeral over the body of one dead from diphtheria, and brought here for burial; but I think you can be assured that in these days of rapid transit and constant movements among the people, Ludington is in danger of having diphtheria brought here in every

year, and you need a health officer constantly on guard and in close correspondence with the central office at Lansing so that, at a moment's notice, he may take action to prevent the introduction, or if that is impossible, then to prevent the spread of this one of the most dangerous diseases to which our children can be exposed.

LIVES MAY BE SAVED FROM SCARLET FEVER.

Then, too, nearly the same remarks apply to scarlet fever as to diphtheria; although in recent years the deaths in Michigan are not so numerous. Yet, taking the average of years in Ludington about three deaths per year from scarlet fever should be saved by prompt and thorough action even after the disease has been introduced, and, of course the most important service of a health officer is to prevent the introduction of such a dangerous disease.

CONSUMPTION SHOULD BE LESSENED.

Enough is now known of the causation and spread of consumption so that this most important cause of death should be very greatly lessened; and it may be lessened by spreading among the people information concerning its causes and just how it may be in great part prevented. An intelligent and faithful health officer whose time was not otherwise demanded for the practice of medicine to support his family, might do much to put before the people whom he was adequately paid for guarding, the facts collected by sanitarians and State Boards of Health which would enable the people to guard against this disease which is so fatal to them at those ages at which they should be in the prime of life. At least three deaths a year in Ludington should be saved from consumption.

LIVES MAY BE SAVED FROM TYPHOID FEVER.

Some one, familiar with the ways in which typhoid fever is spread, has said that for every death from typhoid fever some person should be held criminally responsible. I should not agree with that, because I think that among a large proportion of the people the ignorance which still permits the disease to spread should be pleaded in extenuation. But intelligent health officers can inform the people under their care how to restrict the spread of typhoid fever, and how to do many things which tend to prevent the occurrence of the first case in a community. At least three deaths a year in Ludington from typhoid fever ought to be prevented; and the persons saved would be most likely to be in the middle age when their work would be most productive.

Thus an efficient health service, having thorough coöperation of the people, should save in Ludington each average year, 15 lives, ten of the persons being children and five grown persons. I do not say positively that exactly so many were saved during the past year, but I do claim, that, on an average, this number can be and should be saved over and above what would occur without such efforts as those I have suggested. I claim that the health officer should earn and have at least a thousand dollars a year to supervise the work,* and that all of your people should aid him whenever it

* It would be much better if he were paid two thousand dollars per year and he were to devote his entire time to the work.

is necessary, and that expenses should be incurred by the city and by individuals which might aggregate another thousand dollars; and that your people would not only save valuable lives of children and friends most dear to you, but that, by this outlay, money in excess of the outlay would actually be saved which otherwise is lost, that is, if the money were judiciously expended and you secured the efficient service which I have indicated. Let me point out just how some of the saving would occur:—

THE MONEY VALUE OF WAGE WORKERS.

Political economists sometimes estimate that an average man in the early part of the productive period of his life will afterwards earn, over and above what it will cost to support him, one thousand dollars. It is within the memory of some of us that a healthy negro slave could be sold at the South for eight hundred or a thousand dollars, and we will all admit that slaves were not the most industrious persons either. Now if we save from death, and in good health, five adult persons in Ludington in each year, we have saved in money value to the families to which those persons belong five thousand dollars a year which is very much more than I advise you to spend on your health service. Then suppose we say that there are ten children which are saved from the two diseases, diphtheria and scarlet fever. They have cost hundreds of dollars for their maintenance, and if they die all is lost, but if their lives are saved they will soon reach the productive age. They are worth to their families, for what they will earn, say one-fifth the value of an adult person — or another two thousand dollars which we may look upon as profits on our two thousand dollar investment. A 250 per cent profit ought to satisfy any taxpayer in the city. And if one of these children chanced to be your own, or the adult, the bread-winner of your own family, the argument should be convincing; but there is another alternative suggestion—the adult person might be yourself ! which is illustrated by a remark that I heard at the last meeting of the American Public Health Association,—Dr. Smart, of the United States army, was deploring the slowness of the people in public-health work, and said there was little comfort to be had from the thought that years in the future when your name is mentioned some one will say: "Yes,I knew him well; he died, prematurely, eight or ten years ago, of typhoid fever." Well, precisely that may be said of any one of us, because the safety of each one is bound up with that of others; no man lives to himself alone; not only is he his brother's keeper, but his brother, his fellow-citizen, and even a person in a foreign land may send him something or do that which will endanger his life. In fact I suppose that all of our dangerous communicable diseases are brought to us—we do not create them, and much can be done by ourselves, by our families, by the community, and by the health department of our local government (which exists for our common safety and welfare) to protect us from diphtheria, from typhoid fever, and from the other dangerous diseases which may be prevented or restricted.

It is important that you maintain a local health service so that, at a moment's notice, all the measures for the complete isolation of a person sick with one of these dangerous communicable diseases shall immediately be put in operation; that, at any time, the appropriate disinfectants, for use in the sick room and after the recovery or death of a patient, shall be ready, and

shall be faithfully and intelligently employed. It is important that you have, at all times, an efficient local health service so that, in case of need, you can have the benefit of the aid which can be rendered by the State Board of Health. A good health officer is powerless to protect you unless supported by the people, In order that the people shall support him in strong measures for the restriction of infected persons and things, they must know wherein lies the danger, must appreciate the importance of restrictive measures, they must know how isolation and disinfection are accomplished, and how they may be made imperfect, and deaths result. This co-operation of the people, which is so important, can be had if they can be led to see the truth, and they can be led to see the truth, if it is presented to them in the right way at the right time. In an outbreak of scarlet fever or diphtheria, *if prompt notice is given to the local health officer*, and by him to the State Board of Health, the local officer can promptly be supplied whith pamphlets which tell, in brief language, just how to restrict that particular disease; and if the health officer distributes these pamphlets to the *neighbors* of the family in which the disease is, they will then be likely to read and to pay attention to the best methods of preventing the spread of the disease into their own families.

This may serve as a hint as to some of the ways in which an efficient local health service, co-operating with the State Board of Health, and securing the co-operation of the neighbors of those sick with communicable disease, may act for the protection of life and health in the locality.

Every locality that maintains an efficient health service which is actively in harmony with the State Board of Health, has the benefit of the combined experience of all the other similar boards of health throughout the State, and, in fact, of all the experience of similar organizations throughout the world; because the State Board of Health is constantly exchanging the reports of its work for the accounts of work of other health officers and boards throughout the world.

There is an old saying that "dwarfs see far on giants' shoulders." This may serve to fix in our minds the fact that a very humble and ordinary person, acting as a local health officer in an ordinary city or village, may accomplish great results by life saving measures, when he is lifted up and borne forward on the shoulders of all mankind who are engaged in similar work, as he may be so aided if he puts himself in the way of such aid. In this work, the "giants" are always in existence; in many places throughout the world excellent public-health work is constantly being done; but it frequently happens that a locality fails to provide even a "dwarf" to act as a local health officer. I should be glad if each and every city and village in Michigan would constantly employ the best physician within its limits as a sanitary adviser and health officer, one who would put himself on the shoulders of all the "giants" in sanitary science and public-health work, in Michigan and throughout the world, one who would be constantly employed for the prevention, and, when required, for the restriction of disease, and one who would thus save to the people of his corporation not only as much in money value as is expended for public-health work, but also a vast amount of pain, of sickness and agony, and the lives of children and other loved ones who without such public-health work are constantly being torn from their parents, relatives and friends. This is why I plead for the permanent maintenance of an efficient and well-supported public-health service in every city and village in Michigan.

The paper was further discussed by A. Arnold Clark, of Lansing, and A. P. McConnell, M. D., of Ludington.

On motion, a vote of thanks was tendered, on behalf of the citizens of Ludington, to all those gentlemen from abroad who had read papers and taken part in the discussions, and especially to the State Board of Health for the privilege of holding the convention.

Hon. John Avery, M. D., President of the State Board of Health, returned thanks on behalf of the State Board of Health to those who had inaugurated the convention, and those who had prepared papers.

Judge J. B. McMahon, president of the convention, then made a few closing remarks, assuring the State Board of Health that if another convention might be held in Ludington in the future, it would meet with a warm reception.

AMERICAN
STATISTICAL ASSOCIATION

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

PONTIAC, MICHIGAN,

OCT. 17 AND 18, 1889.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF PONTIAC.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1890.]

[No. 313.]

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1889.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

PONTIAC, MICH., OCT. 17 AND 18, 1889.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1890.

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statement of facts and opinions expressed therein.

PONTIAC SANITARY CONVENTION.

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT PONTIAC, MICH.,

OCTOBER 17 AND 18, 1889.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1890.

[These papers and discussions are printed from the manuscript of the authors and from stenographic notes taken by Charles H. McGurrin, Kalamazoo.]

This convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee, consisting of the health officer and citizens of Pontiac, acting with a committee of the State Board of Health.

The following named persons constituted the local committee: Mr. J. W. Bird, chairman; Rev. D. C. Jacokes, Rev. C. C. Miller, Mr. C. B. Turner, Mr. D. G. Arnold, Mr. J. S. Stockwell, Hon. Byron G. Stout, Dr. Mason W. Gray, Dr. H. S. Chapman, Dr. C. B. Burr, secretary, and Henry M. Linabury, treasurer.

The committee from the State Board of Health consisted of Henry B. Baker, M. D., of Lansing.

The officers of the convention were:—President, Hon. Byron G. Stout; Vice-Presidents, Col. J. Sumner Rogers, Orchard Lake, Mr. C. B. Turner. Pontiac, Mr. J. S. Stockwell, Pontiac, Prof. F. S. Fitch, Pontiac, Rev. D. C. Jacokes, D. D., Pontiac, Hon. Mark S. Brewer, Pontiac, Dr. J. E. Wilson, Rochester, Dr. W. G. Elliot, Pontiac, Dr. F. B. Galbraith, Pontiac, Dr. C. R. Burr, Pontiac. Secretary, Dr. Mason W. Gray; Assistant Secretaries: Dr. D. W. C. Wade, Holly, Rev. John Hamilton, Birmingham, A. Arnold Clark, Lansing, Dr. Robert Johnston, Milford, Dr. H. P. Ewell, Rochester, Dr. L. C. Hammond, Clarkston.

Among those present at the Convention, not citizens of Pontiac were the following persons: Hon. Cyrus G. Luce, Governor of Michigan, Sergt. N. B. Conger, director of the Michigan State Weather Service, Lansing, Dr. L. S. Porter, health officer, Vernon, Dr. G. W. Orr, health officer, Lake Linden, Dr. Rhodes, Franklin Mine, Dr. J. S. Caulkins, Thornville, Dr. Best, North Branch, Dr. J. E. Wilson, Rochester, Dr. Henry F. Lyster, member of the State Board of Health, Detroit, Dr. J. H. Kellogg, member of the State Board of Health, Battle Creek, Dr. V. C. Vaughan, member of the State Board of Health, Ann Arbor, Dr. Henry B. Baker, Secretary,

State Board of Health, Lansing, A. Arnold Clark, Lansing, and Charles McGurrin, stenographer, Kalamazoo.

First Session—Thursday, October 17, at 2:30 P. M.

The convention was called to order in the Presbyterian church, by Hon. Byron G. Stout, president of the convention. After music, Marche Militaire (piano, four hands, clarionet and trombone), by Misses Kate Morris, Lizzie Thorpe, Mr. Simonds and Mr. Boyd, the President delivered his address as follows:

PRESIDENT'S ADDRESS.

BY HON. BYRON G. STOUT OF PONTIAC.

Through the courtesy of the committee, having in charge the program of the sanitary convention, it has been made my duty to preside at its sessions. I recognize the honor conferred, and shall endeavor to discharge my duty as best I may. In making the customary opening address, the length of the program admonishes me to be brief. I come not as an expert to advance theories, demonstrated by practical experiment, for that is the work of the scientist. It is enough for me to call public attention to certain great physiological facts bearing upon the general health.

But first I must congratulate you upon the interest which, within the last few years, has been awakened upon the subject of a proper sanitation,—so great that the aid of the State has been invoked, conventions, from time to time, have been held in different portions of the country and men of State reputation have been found, who, without pecuniary reward, have devoted much valuable time to the work of bringing the subject of sanitary science to a prominent position before the public.

All this has been done, in recognition of the fact that the *prevention* of disease is even more important than the *cure*, and that a knowledge of well established sanitary rules, diffused among the people, fortified, if need be, by mandatory as well as restrictive legislation, will go as far in promoting the general health as the most intelligent medical practice.

If disease is the penalty of violating Nature's laws, the book of Nature should be open to every one. Sanitary rules are simple and easily defined, while medical science is abtruse and complex. Besides, prevention is cheap, while the cure is expensive. A proper sanitation then has the consensus of the best thought of the world. I honor the medical gentlemen who have been especially active in promoting the objects of this meeting. As a class, however, the practioner is very chary of letting the patient know the secrets of medical practice. The patient must not understand too much of his case. Prescriptions are given in hieroglyphics, which none but the compounding expert can read, and whether the potion is to be given in aqua pura or aqua vitæ, the patient swallows the dose without any questioning. These criticisms do not apply to the medical gentlemen who seek to spread the light through the work of this convention, but exceptions, we are told, make the rule the stronger.

The *prevention* of disease is then the work of sanitary science. The Chinese recognize the importance of *prevention* when they pay the physician for keeping the subject well and not for curing him, if sick. Possibly we may get some instruction from the so-called "heathen Chinee."

If man were constituted so as to draw from his surroundings only such sustenance as he needed, sanitary rules might be less important. But animal life, far more than that of the vegetable, is the subject of hostile conditions. Plant life requires neither pure air nor good water. Healthy animal life requires both.

It is, no doubt, owing, not a little, to the progress of sanitary science that the average span of human life is lengthening, and but for the great strain, incident especially to American business life, we might expect that the Scriptural three score years and ten would be more frequently exceeded. Years ago a generation was measured by thirty years. In the modern tables of the expectation of life, the period is much longer. In some cities the annual death rate is forty, in others only fifteen to the thousand. It is rational to infer that improved sanitation has contributed much to the favorable change.

Modern science quite generally recognizes what is termed the germ theory in the inception and propagation of many of the most virulent diseases. When the experienced surgeon takes the precaution to thoroughly disinfect the operating room, and close carefully from the air the injured tissue, lest possibly germs in the air shall transmit disease, we may begin to appreciate the myriad forms of animal and vegetable life which, unseen and unfelt, only in their effects, float in the very air we breathe.

There are those who subscribe to the doctrine of the progressive creation of matter; there are others who believe that all matter was brought into existence as by a fiat; in either case matter is indestructible, and its differing phases, only changes of form. Over and over again the same matter appears and disappears, integrates and disintegrates, now in the mist, now in the cloud, now in the raindrops, now in the food of man and beast, again dissipated, going down the endless cycle of change. I state only a physical fact when I say that the ocean does not contain a drop of water some atom of which has not a thousand times gone through the process of sustaining animal or vegetable life. This organization and disorganization, this diffusion in forms infinitesimally minute in water and air, through both of which food for animal life is conveyed, demonstrates the necessity that the supply of material shall be pure. To get pure air, not only should all taints be removed but ventilation should be most ample. George Francis Train recognized the import of a great physiological fact when he refused to shake hands with anybody lest he lose electricity, or by the exchange of the waste epithelial scales of the hand, he be no longer entirely George Francis, but part Jones or Ferguson. This may be carrying crankiness too far, but there is sound philosophy in it.

But intimately connected with pure air and pure water is the matter of pure food supplies. Few persons appreciate the extent to which food is adulterated. In the case of dry foods in cans and packages, purity is the exception; but American legislation is not half as careful as is the European in protecting consumers from injurious food products. The police of Hamburg have interdicted the sale of American evaporated apples, on account of the use of zinc drying pans; the acid of the apple forming a deleterious oxide with the zinc. The American pig has been precluded entrance into France, isolated cases of trichinæ in the pork having at times been discovered. In our State, there is a lamentable lack of legislation in respect to food adulterations. Nothing attracts especial attention except the efforts

of some husband to get rid of his spouse by arsenical or other poisoning; and then we are averse to hanging and discuss at length the question whether death by electricity is not a cruel and unusual punishment, precluded by the constitution. Half of our kitchen-ware, thanks to government taxation, is not fit to cook food in for an ostrich, much less a human being. The slow poisoning by means of the oxides of the baser metals is appalling but charitably we attribute the cause to the everlasting scape goat, malaria. But what are the means of preventing adulterations of food? The State should interfere by suitable legislation. Every package containing food preparation should be stamped not only with the name of the manufacturer, but also of the contents in all their proportions. Any material variation from the published proportions should subject the package to confiscation and destruction. It is notorious that the motive for furnishing food preparations in the ground package form is to conceal adulterations.

There is a proper conservatism to be pursued in all things; we should not carry our fears too far; too much bacteriology should not lead us to starvation. The microscope should not be the scarecrow of the hungry (the filthy continue to live, possibly ignorance is bliss). There may be something in the healing properties of faith, whether that come from ignorance or superstition. The denizens of the filthy abodes in our city slums certainly do not die from fear. You can pack a score of Chinamen in a room ten feet square with only the ventilation of a stopper pulled out of a knot hole in the ceiling—there may be something in the thought that there is no danger. All of the new theories as to the inception and propagation of disease may not be demonstrable—the world may still be inhabited in spite of the microbe—this micro-organism has its parasitic enemy as insects have theirs. A current journal says that Dr. Maliconico of Naples has discovered the *microbe of old age.* The editor further suggests that if somebody could now discover the microbe that will destroy the microbe of old age, mix one or two of them with the Brown-Sequard elixir of life, and hypodermically inject us all, the world may take on a new aspect. In that case we may all meet here fifty years hence and demonstrate fully the truth of the germ theory.

Extending to all a kindly welcome, I enter upon the discharge of my duties.

THE WATER-SUPPLY OF PONTIAC.

BY AARON PERRY, PONTIAC, MICH.

In few directions has the advancement of modern science been more marked, or been attended with greater good to the human race than in the field of sanitary science. No longer depending upon pretended miraculous cures in vogue when ignorance and superstition dominated in the field of medicine, modern science has set to work with a will, not only to heal the sick but also to discover the hidden sources and causes of disease and prevent or postpone "the thousand ills that flesh is heir to." In fact the healing art has ceased to be simply empirical and is approaching the domain of the exact sciences. Indeed when we remember the perfection of modern microscopes and the

advancement made in chemistry and physiology, when we remember the rapid progress now being made in investigating the causes of disease and particularly in the germ theory of epidemic and contagious diseases, there seems less excuse than ever before for confining our children in rooms filled with disease germs and carbonic acid or giving them poisons to drink. When they ask for bread we should no longer give them a stone, nor when they ask for a fish should we give them a serpent.

Of equal importance with pure and wholesome food and air, is a bounteous supply of pure and wholesome water. In discussing the question of Pontiac's water supply I shall spend little time on the water-works proper. The water-supply for them is at present taken directly from Clinton river, below Mud lake, and with that lake as well as Dawson's pond, and Timbered and Cass lakes as settling basins, as might be expected, it is clear. It has been chemically analyzed by Prof. Kedzie, and found to be from that point of view, and at the season when he examined it, good and potable water. During warm weather, however, largely because of the microscopical animal and vegetable life it contains, it is unpleasant to the smell and without filtration it cannot be said to be wholesome. Recently it was examined by Mr. Stone and he found that it then contained .05 parts of free ammonia and .17 parts of albuminoid ammonia per million parts of liquid. In September I examined some water taken from a hydrant on Asylum avenue, and found therein the following among other vegetable and animal life, viz: Rotifers, rhizopods (arcellæ), ciliated infusoria, entomostraca (both dead and alive), cyclops, water spiders, fragments of insects and worms, bacteria (vibriones and common air bacteria), other protophytes, oscillariæ, nostocaceæ, spyrogyræ, pediastræ, diatoms and desmids.

Some of these may be and are as innocuous as common water cress in a spring; but water containing an abundance of some of the plants and animals I have enumerated can hardly be said to be potable. Whether the presence of plants or animals indicates bad water depends upon the kinds of such life. Sunfish, perch and water cress would hardly indicate bad water; but it would be no recommendation to say that a reservoir contained cat-fish, turtles, crabs, amœbæ, paramœcia, candocks, cat-tail flags, bulrushes, myriophyllum, ceratophyllum, lemna or any of the protophytes. The water from Clinton river certainly should not be drank during the warmer months without first being boiled or filtered. The presence of microscopical plants and animals indicates that the food on which they live, viz: animal or vegetable decomposition, or their products, is also present, and, taken in connection with the amount of albuminoid ammonia found by Mr. Stone, throws a well-grounded suspicion upon the wholesome nature of such water. As yet very little of the water supplied by the Pontiac water-works is used for potable or culinary purposes; our main dependence for those purposes being upon wells.

Whether a well is a safe source of supply depends on its location, depth and manner of construction. Beyond question the best sources of supply for water are springs, next deep wells, next streams, next ponds or lakes and lastly shallow wells. Springs and deep wells furnish good water only because such water is ground-filtered; and when that is not the case they, even, do not furnish safe water. Filters degenerate and become filthy from much use, consequently the ground of an old city must necessarily be a very poor filter for shallow wells. Stoned wells, either open or platformed, are the poorest

and most undesirable. Next come crock wells, and then drive wells, which, where practicable, are safest of all. There is no support in fact for the popular belief that wells must be open to give the water the benefit of light and air; and platforms serve only as traps and pitfalls for mice, toads, earth worms, spiders, sow bugs, earwigs and even snakes. I know a stoned platform well in Pontiac from which two skilled physicians drank, until their nostrils, not their microscopes or their chemicals, protested so strongly that they compelled its cleaning out and were rewarded by finding in it two toads and a snake in an advanced state of decomposition, to say nothing of earwigs, sow bugs, protophytes and infusorians with which it must have swarmed. If you must depend upon wells, above all they should be protected from vermin as well as surface drainage and sewer and cesspool contamination.

In the investigation of the wells of Pontiac as a basis for this paper the tests for chlorine were made by Stuart Perry. The tests for ammonia were made by George H. Stone of the Pontiac public schools, and the microscopical examinations were all made by myself.

The following is a tabulated statement of the results of our tests for seventeen wells which may be regarded as typical or representative wells for the more thickly populated portions of the city. To understand the evidential force of this table it is only necessary to remember that chlorine indicates the presence of common salt and consequently of privy, sewer or cesspool contamination, and that ammonia indicates the presence of organic matter.

PARTS PER MILLION OF LIQUID.

Number.	Chlorine.	Free Ammonia.	Albuminoid Ammonia.	Microscopically.	Conclusion.	Remarks.
1	114	.013	.02	good	fair	F. S. Fitch's well.
2	114	.400	.055	bad	bad	Electric light well.
3	100	.008	.07	bad	bad	
4	74	.013	.06	good	fair	Well at court house.
5	14	.005	.11	bad	bad	Well at 5th ward school.
6	43	.013	.07	good	fair	B. Redfield's well.
7	13	.006	.02	good	good	High school well.
8	14	.0026	.04	fair	good	Well at Mrs. Tom's boarding house.
9	36	.013	.08	bad	doubtful	Well at old union school.
10	34	.08	.12	fair	bad	
11	285	.03	.10	bad	bad	
12	28	.135	.06	bad	bad	
13	57	.05	.09	doubtful	bad	Well at 3d ward school.
14	25	.0055	.08	good	fair	Well at Turk's store.
15	87	.003	.05	doubtful	fair	Fred Sly's well.
16	371	.03	.14	bad	bad	
17	25	.105	.06	fair	fair	J. D. Norton's well—very deep.
Standard.	20	.02	.07			

Pontiac naturally is favorably situated for wells in its higher portions, but not so favorably situated in other parts. Our tests, as well as correct theory, tend to show that the shallow wells situated on the sloping sides of the drainage shed towards the river are contaminated by percolating waters charged with noxious matter; and there are probably few shallow wells situated for one street either way from Main street, from Oakland avenue to Auborn avenue, that are safe for use. I wish to particularize as unsafe the wells that have been dug through soil that has been transported to cover up and fill up low or marshy sections. The portions of the city near the fifth ward school and from there to the river are objectionable on that account.

Without antagonizing private interests I can safely specialize the following wells in the list given above:

No. two is the well at the electric light station on Lawrence street. Until recently it was used for drinking and it is now used for mechanical purposes. In addition to the chemical tests, I found the following animals and plants in a single drop: Vorticellæ, cyclops, ciliated and flagellated infusoria by the million, rhizopods (actinophrys sol), millions of vibriones and other bacteria, numerous other protophytes, and a dead bug.

No. four is the well on the court house corner and is fair, although it contains too much chlorine and ammonia.

No. five is the well at the fifth ward school. It is certainly unsafe for use. I have been informed that it is dug through "made land," and in it I found bacteria (numerous and active), other protophytes, flagellate and ciliated infusoria and considerable decomposing vegetable fibre.

No. seven is the high school well and at this time is free from contamination.

No. nine is the well at the old Union school. It stood the chemical test fairly well, but I found in it several species of protophyta and it was considerably roiled.

No. eleven is a well from which very much water for stock and some for potable purposes is taken. Microscopically I found in it bacteria, considerable flocculent matter, other protophytes and ciliated infusoria.

No. twelve is a well belonging to a family who have had several severe cases of scarlet fever. Microscopically I found in it active bacteria, a small amount of flocculent matter and another protophyte.

No. thirteen is the well at the third ward school. It is situated within about forty feet of the school privy and is contaminated by it. I found in it ciliated infusoria and bacteria. It is unsafe for use.

No. fourteen is the well back of the store of the Turk Brothers and appears to be fully as good and safe as the well on the court house corner.

No. sixteen is near one of the alleys adjacent to the business part of Main street and is used daily for culinary and drinking purposes by the family. I found numerous bacteria of several species in it, as well as ciliated infusoria and fragments of larger animals. It is a very dangerous well. Its odor is very noticeable even when fresh from the well.

Now that considerable progress has been made in discovering the particular bacilli that cause epidemic diseases, we see more clearly than before the necessity of preventing the pollution of the sources of water-supply. The ability of some disease germs to withstand the variations of heat and cold and moisture and dessication is great. How long they will retain their vitality while in or on the ground and how far they may be carried through

the ground by flowing or percolating waters and survive their journey depends upon many circumstances. A case is on record in Germany where such germs were so carried for a mile and then produced a deadly epidemic. A striking example of the hardy nature of the bacillus of typhoid fever is mentioned by Dr. Shakespeare, an eminent bacteriologist, in the Sanitary News of September 7th last. The town of Plymouth, Pa., obtains its water supply from a small rapid mountain stream. Along that stream about two miles above the water company's reservoirs in the winter of 1885 lived a typhoid fever patient whose discharges for three months were thrown upon the snow near the stream. The germs contained therein were, during the winter, exposed to the most intense cold. In the spring the first general thaw washed the snow with its contents into the stream, and in fifteen days from that time one of the greatest epidemics of typhoid fever ever known broke out among the people using that water. Twelve hundred attacks of that dreaded disease and two hundred deaths followed in a town of only eight thousand inhabitants.

Prudden found typhoid bacilli still alive which had been contained in ice for one hundred and three days. This shows the necessity of looking after your ice as well as your water-supply.

Some of the pathogenic bacteria will not only survive burial in the earth but will actually prosper and multiply in suitable ground. Uffelman, according to Prof. Welch, has demonstrated that the bacilli which cause typhoid fever may live in a mixture of privy products and garden earth for at least four or five months. Prof. Welch also says (Science, Aug. 22, 1889) that the bacilli of tuberculosis and other pathogenic bacteria may preserve their vitality "for a long period" in the ground. These bacteria, when present, are found mainly in the upper layers of the earth and not often in the subsoil. Pathogenic bacteria and other noxious substances get into wells by leaching through the soil, and, in the case of open wells, in many other ways.

Some articles of food, and particularly milk and cream, furnish a good culture medium for the multiplication of certain pathogenic bacteria. The housekeeper should therefore have water free from contamination with which to rinse out her pans and basins or should thoroughly boil it before use, otherwise a single live bacterium left in the bottom of the pan or basin might multiply in the milk, and, being drank by a person, might give such person typhoid fever or some other dreaded epidemic disease.

When we remember the porous, loose nature of much of the soil of this city, it is a matter of surprise that our wells are not even worse than we have found them. Privies and cesspools, instead of being situated as they should be, fifty or more feet away, are, in many cases, as close as fifteen to thirty feet to the family well.

Perhaps the most surprising feature of my experience is the little fear or concern that many people here seem to have when their attention is called to the dangerous character of their wells. "We have used the water right along," they will say, "and have never had any typhoid fever, dysentery, cholera, or diphtheria in our family."

Yes, my dear, deluded sir, you and your family may have slept for years upon the brink of a precipice, but *some* night, when you are in blind, sleeping security, an incidental matter, a bad dream, perhaps, will cause some of you to roll off! You had better exercise a little prudence by moving farther away from the source of danger, before it is too late.

The doctors will tell you that it is not merely the germs of specific diseases that you need to fear, but that bad water will weaken your vital resources, and not only unfit you for the general battle of life, but also make you a more easy prey to all diseases. Besides, many specific complaints, not usually classed as epidemic, are traceable to that source.

In conclusion, I urge upon the city of Pontiac the necessity of procuring filters for its water-works, or changing the source of supply; and upon every well-owner the propriety of abandoning his well, unless, from the most careful tests, as well as from its location and environment, he becomes convinced that it is entirely wholesome and free from contamination.

DISCUSSION OF THE WATER-SUPPLY OF PONTIAC.

BY J. H. KELLOGG, M. D., MEMBER OF THE STATE BOARD OF HEALTH, BATTLE CREEK, MICH.

I really am at quite a loss to know what to say that will add anything to the very admirable and interesting paper to which you have listened. The paper seems to be so exhaustive in its treatment on this subject that I really find very little left that can be added. It seems to me that the citizens of Pontiac are very greatly indebted to the gentleman who has just read this paper, for the painstaking investigation he has made of your water supply. The facts which he has presented to you seem to be very appalling, indeed. Yet I fear many of your people will be contented to go right on drinking this unwholesome water, with the idea that you have used it so long without any apparent harm, consequently it is perfectly safe for you to continue using it. Now it it quite possible that we do become, to some degree, accustomed to using unwholesome things. I suppose that people can become used to using bad water, containing typhoid fever poison, just as they get accustomed to the use of alcohol. I have known of men who drank several pints of whisky in the course of twenty-four hours, and yet did not seem to be seriously affected by it, whereas a half a pint has been known to produce death in persons who have not been accustomed to its use, if taken at once. Now, it is just so with bad water or bad air. It has been very aptly said that a North American Indian or the South American monkey would, if shut up in some of the close houses in which we live, die of consumption, in less than six months. I have no doubt it is true. The same principle holds good in the cases of persons who have been accustomed to the use of pure water when brought to use impure water. Notwithstanding, there is another consideration which ought to receive considerable weight in this connection. That is the effect of the use of this bad water; while it does not produce immediately a fatal effect in many instances in consequence of a person's having become accustomed to its use, it is, nevertheless, continually undermining the constitution; it is all the time filling the body with impurities; it is all the time preparing the way for some serious illness, which will come sooner or later. I have known people to go on for a long time using bad water, apparently not being affected by it, until they were taken suddenly ill with typhoid fever, which was the result of taking

the germs into the system. There is another very important thing which we should consider in this connection: we may have our wells located in dangerous proximity to some sort of vault or cess-pool, or some sort of decomposing matter, and yet not suffer from typhoid fever. Typhoid fever is not produced by filth. It is produced by a particular kind of germ. All germs do not cause typhoid fever.

There are as many, perhaps more, different kinds of germs as of flowers. Some flowers are fragrant, some are wholesome to handle, while others are poisonous, as you know. Now, it is precisely so with germs. Some germs are comparatively harmless, like the germs of ordinary decomposition; they may be taken into the system in large quantities, without very great danger. It has been found that there are some twenty-seven different kinds of germs in the alimentary canal. We do not suffer very greatly from their presence, excepting under certain conditions, as when the general health becomes impaired. But there is a particular kind of germ which causes typhoid fever, and another species of germs which produces cholera, and other germs which cause various other epidemic diseases. There is a particular germ for each species of disease. Suppose your well water is connected with a cess-pool or a vault; suppose a member of your family is taken sick with typhoid fever; some of this typhoid fever material is deposited in the vault and the decomposing matter becomes a mass of typhoid fever material. It percolates down through the earth, it spreads out through the soil and eventually reaches the water of the well, and then the whole family, using water from the well, are liable to be affected. A person may have been using water from a well which is dangerously located as regards some deposit of filth for years before typhoid fever occurs. Germs are not dangerous, provided they are kept in a condition so they cannot multiply; but it is the multiplication of germs which renders them exceedingly dangerous. Consider for a moment how rapidly they might multiply; they are so very small that they cannot be seen by the naked eye, but yet they multiply with immense rapidity. Some germs will double every fifteen minutes, in favorable circumstances for growth. The number which might be produced from a single microbe in twenty-four hours would be vastly more than enough to fill this room.

Each germ produces, at the same time it grows, a poison which ultimately destroys the germ. Alcohol is a product of the action of germs, and alcohol destroys germs. The same is true of other germs. But the unfortunate thing for us is, that these same poisons which are produced by the germs, will kill us, as well as them. A person who dies of typhoid fever, if he dies in the usual way, dies from poisoning, not by the germ itself, but by the poison produced by the germ. The poison produced by the typhoid fever germ is called typhotoxine. Many of the poisons produced by germs are called *ptomaines*; these *ptomaines* are exceedingly poisonous. Many of you, no doubt, have heard of tyrotoxicon, which was discovered by Professor Vaughan; this is a poisonous matter often found in cheese. This tyrotoxicon is produced by a particular kind of germ. These germs get into the milk, and then into the cheese made from the milk, and in that way the tyrotoxicon is taken into the body.

I only mention these facts in respect to germs, so you may see that they are real things; that they are not myths. A number of years ago I was showing a lady one of these germs through a microscope, and she

asked me how long it was; I told her it was about a twenty-thousandth of an inch long. "Oh!" she said, "I am not afraid of such little fellows as these." But it is not the size of the microbe, it is the enormous rapidity with which it grows, and the poisonous substances which it produces. When typhoid fever germs are taken into the body, they grow, when the conditions are favorable for growth. They get into the glands, and there they develop a poisonous substance which is carried to the brain. Now, the same is true about other germs as well. As I said, I can hardly add anything to the admirable paper to which you have listened, but let me call your attention to one fact which may be familiar to you, and I am not sure but what your attention has been already called to it in the paper, as I was not here to hear the first part of it (I was making a little visit to your water-works to see what sort of water you were supplied with). Where does the water in our wells come from? There is a popular notion, I believe, that water runs from streams under the ground. I think this idea is propagated by the water-witch fallacy. Now, there is water everywhere under the ground. In such localities as this there is always water in the earth. When it rains, the rain fills the soil up; when it rains several days, the soil becomes completely saturated with water clear down to bed rock, or to clay. Now, this water passes off, some of it soaking down through the soil into the water courses or reservoirs in the earth, for there are reservoirs under the ground. A dug well is simply a hole in the ground which goes down into the ground water. This water varies in height as indicated by the change in the level of water in dug wells. The height of the ground water varies with the season, and according to the amount of rainfall or snowfall. In the spring the ground is generally full of water. In a dry summer, like the last season, the wells are, in many places, and especially in localities like this, very dry, for the ground water goes lower down than ordinarily, and consequently the wells are empty.

The water that is thrown into a cess-pool goes through the earth, spreading out, a greater or less distance, according to the nature of the soil, and ultimately finds its way into the ground water. Now, this ground water generally flows with the surface of the ground and in the direction of the nearest stream. Suppose you have a cess-pool or vault upon a hill side, and lower down you have a well; you can readily see that the foul water is certain to flow down into the well sooner or later. It is not an uncommon thing to see a barn-yard, a pig-sty, a poultry house, vault, cess-pool or something of that kind up on a hill side and the well between it and the house, located lower down. You often see wells in a barn-yard, for convenience for watering stock, and the family water-supply is taken right out of that same well. Now, such water-supplies are always unsafe. Indeed, I think it is not going too far to say that a dug well is never safe. Frequently something gets into it from the top; you do not know what may get into it through the sides. If your vault or cess-pool is made water-tight, it will not defile the ground water; but it will not remain tight, and it is never perfectly safe to have wells in a community where vaults are used. Vaults ought to be entirely abolished; they ought to be prohibited by law. There can be no doubt about this, I think. In my city sometime ago a gentleman brought me some water, and desired me to make an examination of it. I found the water exceedingly bad. I inquired as to the location of the well, and looked the matter up; I found it came from a well on the south side of a certain street, towards the river. The man's premises were in very good condition, and I

did not see why the water in the well should not be good; but the family were all sick, and he wanted the matter investigated, so it was looked into. The neighbor across the street was afraid of his dug well, and so put in a drive well, and thinking it useless to keep the dug well on the premises, and having his barn-yard full of material that needed to be removed, he threw the contents of his barn-yard into this well in order to get rid of it in the quickest way possible. The consequence was that the contents of this well were drained off into the other man's well, a distance of almost twenty rods away, so that his water was dreadfully contaminated.

This subject is a very long one and it is impossible to say all there is to be said regarding it in a fifteen minutes' speech, but let me call your attention to one thing more and then I will sit down. That is, the importance of giving good water to animals. People generally feel that any water is good enough for the cow, the horse, or any of our domestic animals, and they generally allow them to get this water where best they can. Wells are located in the barn-yard, where the wells *must* be contaminated by filth. Now, this is almost as dangerous as it is for human beings to use bad water. The milk you get is liable to be contaminated in various ways. Cows drink bad water almost constantly, and, becoming accustomed to it, do not suffer very much; but the typhoid fever germ may be propagated to an enormous extent in the alimentary canal of the cow and thrown off in the discharges. Now, it is almost impossible to keep the milk entirely free from bits of filth that will drop off the cows while they are being milked, unless unusual care is taken. Unless the fingers are carefully washed, and the milk cans carefully attended to, it is certain that the milk will be more or less contaminated. Experiments have been made in the agricultural experiment stations with reference to the germs found in the milk. Many different germs were found. One germ produced the odor of a pig sty, another of the barn-yard, others developed the odor of sour milk. It may be that typhoid fever is often contracted in this way. Tape worm and other parasitic diseases are propagated through the medium of impure water. The water that we furnish to our domestic animals should be pure, just as pure as that taken by ourselves.

If you are not absolutely certain that the water is pure, boil it, because boiling it will kill the germs. There are no germs that will survive a boiling temperature, therefore all germs are killed when the water is boiled. You will not be likely to catch typhoid fever if you boil your water and milk. As you know, there was an expedition sent from Germany to Egypt to see if they could find out the particular germ that caused cholera; the members of the expedition took pains to boil the water that they drank and went freely among the patients in the cholera district, and only one of them suffered from cholera. Now, the same thing is true in regard to milk. In this matter of boiling water and milk we are really behind many barbarous and semi-civilized people. The Chinese, in many parts of their native land, will not drink water unless it has been boiled. In that country many people live in boats on sluggish streams, and all sorts of filth go into the river, from which the drinking water also comes, and yet the natives do no not suffer from cholera, simply because they boil the water. Many tribes of savages live surrounded with filth, yet do not suffer from epidemic diseases for the simple reason that they always boil the water used for drinking purposes. They would not take a drink of water if it was not boiled any more than you or I would eat grains or vegetables that were not

cooked. I have under my medical care a large nursery of small children. During the last summer, when a great many children have been sick of bowel diseases in the same community, not one of these children has suffered from any kind of bowel trouble, during the whole summer, simply because the water was boiled and the milk was boiled.

Dr. C. Earle, Pontiac: While this question is under discussion, there is one point to which I would like to call attention, that it may be explained to our satisfaction, as to the practical use of the filter in regard to the water supply of this city. Of course the question is now, Will the filter remove this evil that has been spoken of here and secure successful, thorough protection?

[This question was replied to by Dr. J. W. Seeley and Dr. J. H. Kellog, after the reading of the next two papers.]

THE DISPOSAL OF SEWAGE AND WASTE IN PONTIAC.

BY E. C. SMITH, C. E., PONTIAC.

The desirability of a system of sewers for Pontiac will hardly be questioned in this convention, if anywhere. When we voted in favor of water-works, most of us probably had it in mind that sewers would follow almost as a matter of course, and our common council has employed a civil engineer to make a survey and prepare plans and specifications for a complete system of sewers. Any argument in favor of sewers would, therefore, seem to me to be superfluous, but the secretary has requested me to present some of the reasons why sewerage is desirable, and while I have no new and startling discovery to present, yet a rehearsal of some of the reasons may lead us to ponder upon the subject, and the more we reflect upon it the more likely we shall be to arrive at the belief that sewerage is not only desirable but indispensable.

The subject is an unsavory one, and we are apt to put it out of our thoughts, as unpleasant to dwell upon, but it must be met, and it is important to us and to our children that it should be met, at once, and be decided upon scientific principles.

The arguments in favor of a system of sewerage, then, are comfort, cleanliness, health, and even life itself. And why are sewers so important as to affect life or health? Because Pontiac is an old town, and the vault or cesspool system has always been in use here. When the vault is nearly filled it is covered over lightly with earth, and another one dug near by, and in this manner many yards in time have five or six of these old vaults. Until recently our drinking water was all obtained from wells, and many still prefer the well water to that supplied by the water-works. The well is also in the yard, often at no great distance from the vault, and dug deeper than the vault.

The water first thrown into a new vault will percolate into the ground, the earth will purify it, retaining all the noxious matter, and the water will eventually reach the well, or the underground streams which supply the well, thoroughly filtered and pure. But the ground soon becomes saturated

with impurities and will no longer cleanse the water, which must carry its impurities beyond the saturated earth into new and clean earth, and leave them there.

Is it not perfectly plain that this process, if continued long enough, must inevitably saturate the entire intervening space, until the water reaches the well, with all its original impurities?

The vault is at the apex of a cone of saturated earth, constantly being augmented by sinking deeper and spreading wider. The bottom of the well is the apex of an inverted cone, receiving the drainage from a large area of surface surrounding the well. It is inevitable that these cones must meet, and the well receive the impurities from the vault.

Many zymotic diseases are disseminated through the medium of micro-organisms such as bacteria, micrococci, bacilli, vibriones, spirilla, etc., and these germs of disease frequently find their way into the human system through the medium of drinking water. Typhoid fever and cholera have been shown to be much less prevalent in sewered cities than in unsewered cities—in clean dwellings, than in unclean ones—and many cases of typhoid fever have been traced directly to the use of well water contaminated by sewage. Mr. Erwin F. Smith has collected statistics from most of the leading cities of Europe and America, and has conclusively shown that the death-rate is greatly diminished in cities by the introduction of systems of sewerage. No expense should be deemed too great, if necessary to guard against the spreading of disease, and to make our city one of the healthiest, as it is already one of the handsomest in the State. Let us not wait for the scourge of a fatal epidemic to force upon us the truth that we must protect ourselves and our families, in modern civilized life, or we shall surely suffer for it.

We will now pass to a consideration of some of the points to be observed, and some of the mistakes to be avoided, in adopting a system of sewers, designed to be a permanent improvement to our city, and a safeguard to the health of our citizens.

The sewer should not be too large; the modern tendency has been to reduce the size of the sewer as nearly as possible to the capacity for carrying the estimated number of gallons to be conveyed. If the sewer could be kept full all the time with swiftly flowing water it would keep itself flushed, and leave no opportunity for organic matter to find lodgment and decompose and produce noxious and disease bearing gases.

And this suggests the next point which is relative to the gradients: These must conform more or less to the natural topography of the city, but wherever possible the grade should be heaviest at the start and continuously down grade to the end. Let there be as few level stretches as possible, and no conceivable circumstance can excuse the slightest up grade, anywhere in the direction of the flow of the water. The oval or egg-shaped form, laid with the small end down, is still regarded as the best. The round pipes, however, well glazed and smooth, are much used, The joints must be thoroughly cemented so as to be water tight and the inside left perfectly smooth.

Ventilation is absolutely essential, and is a question of such difficulty that it has never been satisfactorily solved. It has been suggested to connect the sewers by pipes with furnace fires, or with street lamps where gas is used, and so to destroy by fire the noxious gases; but the difficulty with all such methods is the disproportion between the means proposed, and the vast extent of the sewers, and consequent amount of gas to be disposed of.

It is better than nothing to have frequent openings through manholes to the outer air, although this is admitted to be but a poor expedient, for the draft is as likely to be downward as upward, according to different atmospheric conditions, and foul air is heavier than pure air; but even when the draft is downward into the sewer the gases would be diluted with pure air, and thus become less dangerous, hence this method of ventilation is better than none.

After I had written thus far I was permitted, through the courtesy of Engineer Parker, to examine the plans for the proposed system of sewerage for Pontiac, and find them to comply very nearly with the above requirements except as to shape, the main sewer being round instead of egg-shaped in section.

The mistakes to be avoided are the converse of the foregoing, and are well summed up by that eminent sanitary engineer, Col. Geo. E. Waring, in a terse and amusing, as well as terribly suggestive description of the sewers of New York, Boston and Philadelphia, which he says are "highest at the lower end, lowest in the middle, biggest at the little end, receiving branch sewers from below and discharging at their tops; elongated cess-pools half filled with reeking filth, peopled with rats, and invaded by every tide; huge gasometers, manufacturing day and night a deadly aëriform poison, ever seeking to invade the houses along their course; reservoirs of liquid filth, ever oozing through the defective joints and polluting the very earth upon which the city stands."

Supposing our sewers to be constructed and the vaults emptied by means of odorless excavators and filled in with clean clay, a very grave question presents itself to us in the matter of house connections and plumbing. If we are to admit the sewer gas to our houses, to our dining rooms, to our ice boxes, to the sleeping rooms of our children, it would be much better never to have sewers.

I find that I have left myself but little of my allotted time to dwell upon the interesting question of plumbing. I can only mention the main points to be observed.

As the branch reaches the cellar wall a ventilating pipe should be carried up from it, outside the building and above the roof. The main soil pipe inside the house should also be carried full size above the roof. Then we should have all connections to water closets, sinks, wash-stands, etc., properly trapped and the traps all ventilated by means of branch pipes carried full size to a main ventilating pipe, which pipe should be independent of the soil pipe, and also carried above the roof.

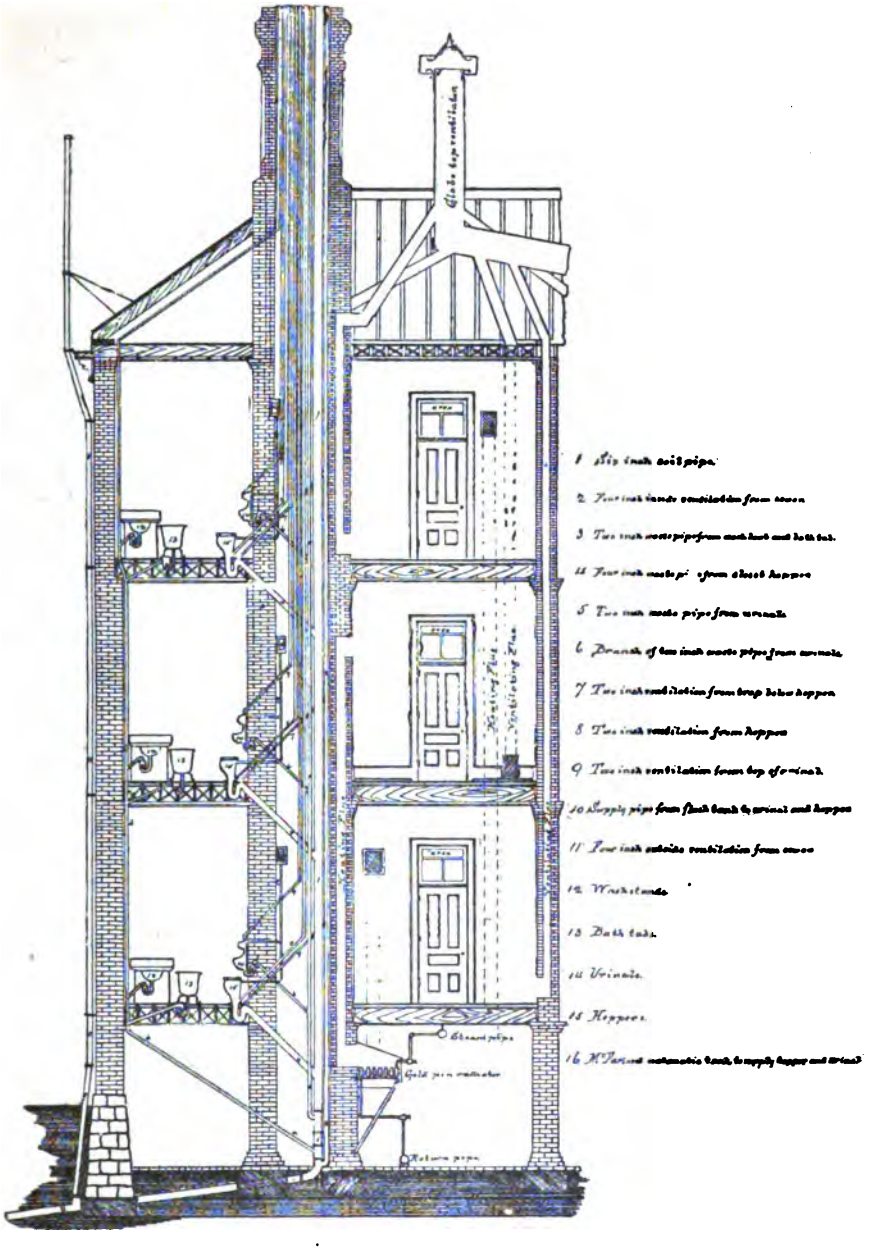
STATEMENT CONCERNING THE SEWERAGE SYSTEM IN CONNECTION WITH THE EASTERN MICHIGAN ASYLUM

BY O. B. BURR, M. D., MEDICAL SUPERINTENDENT.

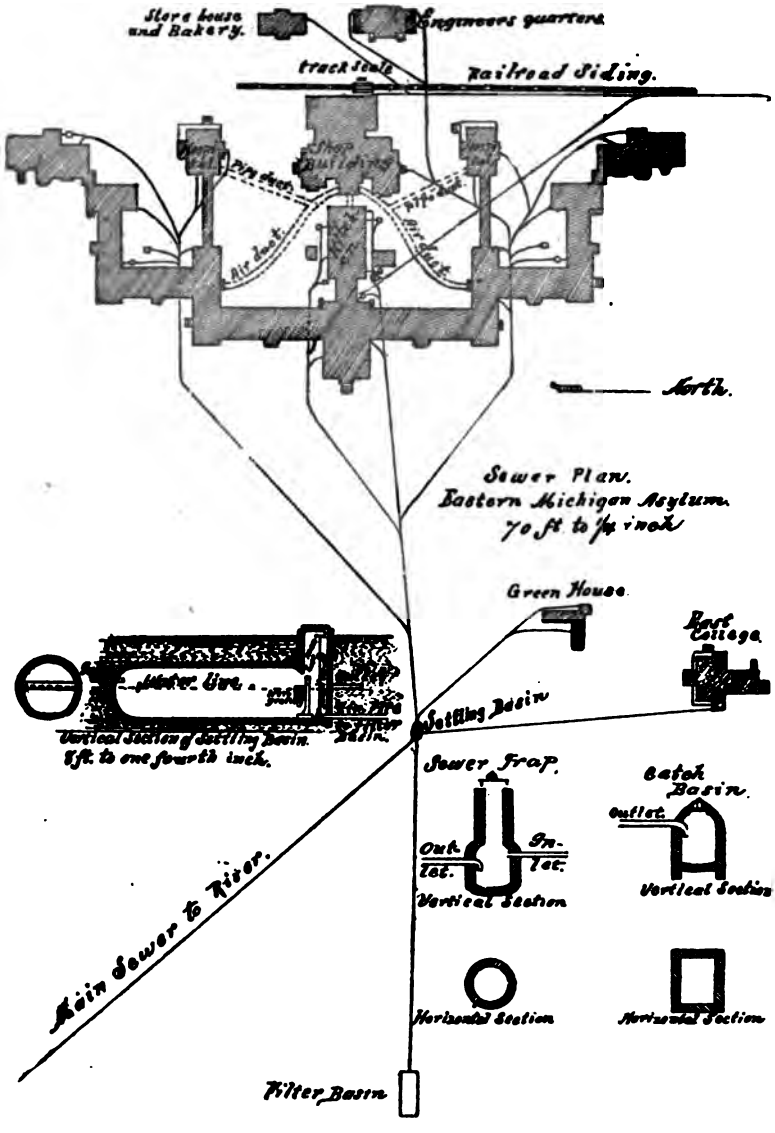
Sewer traps, made of brick, having an iron top and water seal, varying from 5 to 9 feet in depth, are located at various points near the asylum building. Through these the sewage passes, and from them old rags, shoes and rubbish, which disturbed patients are apt to deposit in the stools, are frequently recovered. The matter deposited in them is removed once a week.

Provision is made for the removal of surface water by catch-basins covered with iron gratings, placed at convenient points about the grounds of the institution. These vary in depth and are built, as the sewer traps, of brick.

Sewer-pipe is of iron where it goes under the building, and is elsewhere of vitrified tile. The diameter of pipe is 6 inches. The converging lines on the diagram indicate sewers from the different parts of the main building and detached buildings. The main sewer runs directly east from the center of the main building 400 feet, to a settling-basin of oval shape, arched, built of brick and of the dimensions of 20x10. Under ordinary conditions the valve, which is shown in the vertical section on the diagram, prevents the escape of the solid contents of the sewage. Fluid contents (the sewage is much diluted by the water constantly in use in different parts of the building) are run through a strainer which is placed at the water level. From the settling-basin the sewer is prolonged to the river, a distance of about two miles, but it carries no solid matter. Once a week the valve at the bottom of the man-hole, shown in the vertical section of the settling-basin, is opened and the solid contents flushed out into a filter basin located 500 feet farther east, near the garden. Into this filter-basin, which is of the dimensions of 100x25x2, are collected leaves, partially rotted manure and decaying organic matter of all kinds. This compost is worked over at intervals, and after thorough rotting, is placed upon the land. The fall from the main building of the asylum to the filter-basin is about 25 feet.


Sixty inch soil pipe.
Four inch vent ventilation from sewer.
Two inch waste pipe from bath and bath tub.
Four inch waste pipe from closet hopper.
Two inch waste pipe from urinals.
Branch of two inch waste pipe from urinals.
Two inch ventilation from trap below hopper.
Two inch ventilation from hopper.
Two inch ventilation from top of urinal.
Supply pipe from flush tank to urinal and hopper.
Four inch outside ventilation from sewer.
Wash stands.
Bath tubs.
Urinals.
Hoppers.
Steam pipe.
Gate gas ventilator.
Return pipe.
Heating Flue.
Ventilating Flue.

Section showing heating plumbing and ventilating of new Hospital building



The tracings and blue print from which the above cut was made are the work of Charles Anderson, foreman of construction at the asylum.

DISCUSSION.

Dr. C. Earle of Pontiac: This question of filters, let me again speak of it, is a question to which I have given but little attention, while some of the gentlemen present have given much attention to the subject, and I would like to hear a little explanation regarding it. The question of water-supply

has been thoroughly discussed here, and if some of the gentlemen will have the kindness to elucidate the matter to the satisfaction of us, I, myself, would like to hear any suggestions that might be made regarding it, such as the extent to which it would be able to prevent those deleterious conditions of the water as shown by analysis.

Dr. J. W. Seeley, Pontiac: Mr. Chairman, I came here as a spectator merely, but I must say that I have seen a good many different kinds of filters, and have never seen a filter yet but what was good when it was first put in, and bad after it had been used for some time. I have been in a country where the people have used rainwater for domestic purposes; and they would build cisterns with water lime, in order that they might contain water. They build the cisterns square, across one corner, diagonally, partition off a small corner, wall that corner up with brick, with no flues to attach to it (the brick were porous), they would catch the rainwater from the building and attach the pipes to that corner; that corner being partioned off, would form a filter so that the water would pass through the brick into the main part of the cistern. But when the cistern was constructed in that manner, for a long time (say, perhaps, six or eight months), they would get pure water. But in the course of time, the water would filter through the brick and be just the same in one side as in the other. At Mt. Clemens, on our peaceable Clinton river, they have put in water-works recently, and they have put in a filter. A short time ago I was speaking with one of the residents of that place who expressed himself as very highly pleased with the result of that filter. They take the water from this river, which runs from Pontiac to Mt. Clemens. As I say, they are very highly pleased with it now, but in the course of time, I think, will be highly displeased with it.

Dr. J. H. Kellogg: It seems to me that something more should be said on this subject of filters. There is no doubt that it is possible to filter water, even the most impure water, in such a way that it will be thoroughly purified and be entirely wholesome. But it is also true that it is practically impossible to purify by this means, on a large scale, very impure water. The practical value of filters, those that are put in for city water supplies, is simply to remove the suspended matters, as sand and material of that sort, which is not in itself, really unwholesome to any very great degree, but more of an inconvenience. But dangerous impurities, matters which are dissolved in the water, poisonous ptomaines, germs, etc., are not wholly removed by ordinary filtration. Charcoal filters may remove all these organic matters, but our filters which are constructed for city water-supplies, do not remove organic impurities, except to a very slight degree. They simply remove the suspended impurities. Now, if you had a filter that removed the impurities, the filter itself would become a perfect hot-bed for poisonous impurities.

I think it has been demonstrated that filters cannot be relied upon except for removing suspended impurities. Water that is dangerous before being put into a filter cannot be relied upon after it is filtered. Filters cannot be relied upon as a protection from typhoid fever, cholera or other contagious diseases.

Second Session, Thursday Oct. 17, 1889, at 7:30, P. M.

The convention was called to order by the president.
After a vocal selection rendered by the children of the Pontiac public schools, Dr. Henry F. Lyster discussed the sewerage of Pontiac as follows:

DISCUSSION OF THE SEWERAGE OF PONTIAC.

BY HENRY F. LYSTER, M. D., MEMBER OF THE STATE BOARD OF HEALTH, DETROIT.

I am reminded by hearing the sweet voices of the children, of an audience where I was present this afternoon, at the raising of a flag over the Chapman school, Detroit, where I had been kindly called to say something to the children. Now, I have not been accustomed to addressing children, but learning that General Trowbridge and William C. Maybury had succeeded so admirably at another school, at a flag raising, I was more at ease. It has never been so embarrassing to address a sanitary convention. The sanitary convention discussion interests all those who are middle aged, those who are older, those who are no longer young, and some young people. People come to the sanitary convention, I suppose, to hear all that is important with reference to health, and I hardly think there is any more important than that which belongs to the department which I am asked to discuss: the removal of the excreted and effete matter, the management of sewerage. The attention of the medical profession and of sanitarians generally for the last twenty-five years has been largely given to this subject.

Decomposing and fermenting material retained in the vicinity of the hospital, hotel or residence, is an active and ever constant source of disease; and wonderful suppressions have been made in the management and the care of the sick and wounded persons, by the department of medicine and surgery, by applications to remove the fermenting and decomposing matter. You have heard a good deal about antiseptics and about the value of antiseptics, about the wonderful value that there is in carbolic acid and in bichloride of mercury, and corrosive sublimate solution, and in the several solutions that have been recommended, and the use of chloride of lime, in order to prevent disease by the decomposition of the structures of the disease germs. Now, it has been so that while these are removed, cleanliness is equally valuable. That with the use of antiseptics and antiseptic methods, we can wash away the antiseptics, afterwards use pure water that has been boiled, and we have then a condition of affairs to use in surgery and in medicine. In other words, perfect cleanliness is the foundation of the limitation of disease in this direction. So that hospitals that have been used for a great many years and are about to be given up, have been found to be perfectly habitable, and severe cases of injury and disease are treated successfully in them, because they have been rendered perfectly clean. Now, how is it about the town? It is only an accumulation, a collection of people differing from the hospitals only in the fact that there are numbers of residences, but, these residences being located close together, there is liability of contamination of the water-supply,—these old towns, like Pontiac, Flint and Tecumseh, having opportunities for the contamination that is not

possessed by the new towns where the soil of the village is not yet contaminated. The old plan of storage of effete matter in vaults and cesspools is the worst possible for the contamination of the soil.

The wash water from the kitchen goes down to the cesspool. A man who is establishing his house has a yard, perhaps one hundred feet wide and two hundred feet deep; he digs a hole there and fills it with cobblestones, starts a cesspool in which goes the kitchen sewage,—material that should be gotten rid of,—the decomposing material fermenting very rapidly in the ground and spreading out in the ground, particularly such ground as you have here, gravelly loam. And then there is a vault where all the human excretion is received, liquid and solid, and the vault is built in the same way, intended to leak out in the ground, so that the liquid contents shall disappear. And here we have the poison given by the person who is supposed to be in charge of the family and who has the great care of the family. He starts the cesspool in the first place, and the thing which will carry off his family is the entrance of the poison, like the typhoid fever germ, for instance, suddenly the fever breaks out, and he loses it, may be, two or three of his family, whereas, if this effete matter had been removed, or had been burned or destroyed in some way, (better than all the storage systems) there would have been health maintained and no opportunity for such a contingency to exist. So that our sanitarians are all in favor of the non-storage system; they want everything removed that has served its purpose, and, in economy to the household, to have it removed at once; haul it off as fast as it accumulates, then you will get good water; until you have a good sewerage system, the water will not be good. If it should be only temporarily stored, have it removed; hunt up the authorities instead of letting it remain a week or longer, and pick up such garbage as can be managed in that way. Have the filth and decomposed matter taken off from the premises, away from the house; I do not care so much how you do it, but only do it, instead of storing it and preserving it and keeping it there infiltrating the ground year after year until the opportunity occurs for it to poison your family.

In a late epidemic of cholera, in 1875, (we hope we never will have Asiatic cholera again, but we may have) this plan of storage was pursued all over the country, it enabled the epidemics to spread around, and wherever persons went with the slightest cholera or diarrhea, they brought the germs into the city by using these public storage vaults, and caused the whole community to suffer from the poison of cholera. So it is with the typhoid fever poison every now and then. When persons have the fever, sometimes they have merely the fever known as "walking typhoid." Whenever a person is in that condition he is safer if kept in bed, because he is liable to carry around these germs, and in occupying water closets and vaults and such places, the germs are thrown off into this material that is ready to receive it, and from which it is carried to our water-supply. Now, those are but two illustrations and there are many such marked illustrations, which we could prove by the statistics and the clinical history of the epidemics. If we have these two well marked clinical examples, how many other diseases are there that are not very violent, that may be propagated in the same way? We do not want a convention of this kind to occur without offering some very practical suggestions. If you have a good water-supply here, you can have small sewers and the storm water can be gotten

rid of by a separate drain. You may thus use a six inch pipe for sewerage, and not put the people to an expense of over six thousand dollars, then connect your house with a four inch wrought iron pipe, plenty large enough for the house, and with a good water-supply like that afforded in many places, all the effete matter may be carried from the house; now that is one plan. Where you do not have the water-supply, but your own wells, you cannot rely upon the water carriage system, then rather than vaults and cesspools, you should adopt the dry earth plan. The reception of the effete matter into boxes should require its removal at least twice a week by the city authorities. Now, that plan is a very safe one. It is a desirable one for the farmers; it is a desirable one in the village, and it is a very excellent one for the city.

In the large city of Birmingham, in England, with some three hundred, I think, or five hundred thousand, half of that city depends upon the dry earth plan for the removal of effete matter. So, there is no danger of Pontiac being too large for that simple method in the management of the excreted matter recommended. It is equal to any, and better than anything like storage. It has been proved a safe system, comparatively speaking, and it leaves you with a better condition as regards your use of well water. If you use the dry earth storage system, and have no vaults, or cesspools, then your wells are less apt to be contaminated, and the water-supply would last longer in a comparatively large city without contamination than it will on the other plan, although we must understand that sanitarians generally are afraid of well water, rather opposed to wells anywhere, even drive wells. All wells are objected to, and only large bodies of water are looked upon favorably, like a good, large lake, where the water can be allowed to be stored up a long time, clarified and cleared up, and remain a long time without contamination. From such a place as that, you might get a good, healthful supply of water.

Of course, rain-water is the best potable water. If you have a cistern situated away from vaults and the like, you can have a large amount of water received into the cistern, and thus have a comparatively safe water-supply, in places like this; particularly so if you filter it, or if you go further, and boil it afterwards. The cistern, where there is some automatic arrangement attached, is very good water, and I recommend that you use cisterns largely, and whether you use well water or cistern water, boil it. I hope that this city will make some effort in the way of having a good water-supply.

THE PREVENTION OF CONSUMPTION.

BY A. ARNOLD CLARK, LANSING, MICH.

I realize that I have only twenty minutes in which to present this subject, and that all of you are anxious to hear the Governor, who is always eloquent upon whatever subject he speaks. I realize also that there are many important topics to be discussed, but still I believe that the most important subject that will come before this convention is this. It is true that fifteen or twenty citizens of Pontiac die every year from this disease,* and if this audience is an average Michigan audience and consumption is not better restricted in the future than it is today, one out of every eight persons here to night will die from this disease, and this is true with slight variation over the civilized world. †

I have here (next page) a diagram accurately drawn to scale, showing the relative number of deaths from different diseases, and from this you will see that every time one person dies in Michigan from small-pox forty or fifty die from consumption. It is important to prevent scarlet fever, it is more important to prevent diphtheria, but the most important of all diseases to study and prevent is this great "white plague" which annually destroys three or four thousand citizens of our State.

One hundred and fifty thousand die from this disease each year in the United States, probably five millions throughout the world. During the very few minutes that I have been standing upon this platform some citizen of the United States has died from this disease, and during the hour to be devoted by this convention to the discussion of this subject, 17 men and women in this country, men and women filled with happy, hopeful dreams, men and women to whom life is joy—will surrender their lives to this great destroyer.

Not only is consumption our most dangerous foe, but there is

NO DISEASE ABOUT WHICH SCIENTIFIC MEN KNOW MORE

and which they could so easily prevent if the people only knew. There is no longer any doubt about it,—consumption is a communicable disease, caused by a living germ, and the way to prevent consumption is to find the germ and kill it.

There is a great deal of misunderstanding in the popular mind as to the relative importance of communicability and heredity in the causation of this disease. It is said that thirty per cent of all who die from consumption had an ancestor who died of consumption, but thirty per cent of all living had

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*In Vienna, Austria, the death-rate from consumption is as high as 77 per 10,000 inhabitants; in Washington, D. C., 42; in Detroit, Mich., 18. Phthisiology, Historical and Geographical. Evans, pp. 43 and 102.

† In Vermont one death in every five is from consumption. The percentage is nearly as high in other New England States and becomes smaller as the line is carried westward, due probably to the different ages of the inhabitants. In Utah only one in every 33 deaths is from consumption, in New Mexico, one in 43. The high percentage in California (1 in 6 +) is probably due to immigration to that State of those who have contracted the disease elsewhere. The average throughout the world is about 1 death in 7. Phthisiology, etc., Evans, pp. 99 and 100.

DEATHS IN MICHIGAN; 1876-'87.
CONSUMPTION.
DIPHTHERIA.
TYPHOID FEVER.
SCARLET FEVER.
WHOOPING-COUGH.
MEASLES.
SMALL-POX.

a father or mother who died of consumption. Did your father, your grandfather, your uncle or your aunt die of consumption,—then, if you get it, it is declared hereditary. Then every one ought to have consumption, for every one has had some ancestor die of this disease. In this way you can prove every contagious disease hereditary. I have in mind a case where a mother died of consumption three or four years after a daughter died of this disease. Some seemed to think the mother might have inherited the disease from the daughter! It is natural that several persons in the same family should have consumption just as several persons in the same family have scarlet fever,—they catch it.

Of course I am not prepared to say that there may not be isolated cases of the transmission of the germs of consumption from the mother to the offspring; it may be true that the children of consumptive parents have less resisting power,* but the active cause of the disease is the germ communicated from person to person, and if we could destroy all the germs of consumption tonight,—we would destroy consumption.

Where does consumption first make its appearance? In the lungs,—because the germs of consumption are carried to the lungs in the air which we breathe.

Why do you wake up some fine spring morning and find your lot full of thistles growing where none grew before? Not because the thistles have grown up spontaneously from the soil, but because the seeds of thistles have been carried in the air from your neighbor's thistles. So in the same way these rod-shaped bacilli,

THESE SEEDS OF CONSUMPTION IN THE SPUTA

from consumptive patients are dried, picked up by the air, carried to your lungs, find a congenial soil and grow consumption. As you can't gather figs from thistles you can't get consumption from anything but consumption, and the way to prevent consumption is to destroy the seed.

It is not necessary here to speak of these germs † except for purposes of prevention to consider where they are usually found.

During the last two or three years Dr. Cornet of the Berlin Hygienic Institute has been carrying on a series of

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*Koch states his position as follows:—"Now, tuberculosis is very rarely found in the foetus and the newly-born, hence we must conclude that the infective material comes into operation only exceptionally during intra-uterine life. * * * In my opinion, hereditary tuberculosis is explained most naturally by supposing that the infective germ itself is not inherited, but rather certain peculiarities favorable to the development of germs which may come in contact with the body; in fact, it is the predisposition to tuberculosis which is inherited." "The Etiology of Tuberculosis," Koch. New Sydenham Society's Transactions, 1886, p. 200. The original statement may be found in "Mittheilungen aus dem Kaiserlichen Gesundheitsamte," Zweiter Band, 1884, p. 86.

Herman M. Biggs, M. D., Demonstrator of Anatomy in the Bellevue Hospital Medical College, etc. (in a paper in the Buffalo Medical and Surgical Journal, June, 1889, p. 635) says: "The practical point is, that in at least ninety-nine (99) per cent of all cases of tuberculosis, the infection occurs after birth, and the disease is not transmitted by heredity. This fact cannot be too strongly emphasized, for, even if an inherited *predisposition* to the disease is presumed, which we do not at all admit, there is still a vast difference between an existing disease acquired by inheritance and a predisposition to a disease, development of which may be prevented by the observation of certain precautions. Further the infectious nature of tuberculosis being admitted, and its transmission by heredity being excluded, the disease is at once thrown into the class of preventable diseases."

†Briefly, it may be said of germs in general that there are three forms usually met with,—those round like a ball (called micrococci), those shaped like a lead pencil (called bacilli) and those shaped like a corkscrew (called spirilla). The germ which causes consumption is a bacillus, called *bacillus tuberculosis* and is easily distinguished from other bacilli by its color-reaction. These bacilli are 1-3000 to 1-12000 of an inch in length. They occur in the cells of the lungs singly, in pairs and in bundles. They multiply by division—one bacillus separating into two, and by forming spores—or seeds. They are not easily destroyed, though they do not resist continued boiling or putrefaction.

EXPERIMENTS WITH THE DUST TAKEN FROM THE WALLS OF ROOMS

and he has found that the sponge scrapings from the walls of rooms inhabited by consumptive patients inoculated in guinea pigs produced consumption in those animals.* Sponge scrapings from the walls of rooms where no consumptives had been did not on inoculation produce consumption in the guinea pigs. Now how did the walls of those rooms become contaminated with the germs of consumption? Not by the breath from the consumptive patient. Guinea pigs have been placed in a rubber sack and they have been breathed upon two hours a day for six weeks by consumptives without contracting the disease.† So, the danger is not in the breath.

Cornet found that where consumptives had invariably expectorated in cuspidors filled with water the dust from the walls of the room showed no germs, but where the sputa had been allowed to dry on the floor, the germs had risen with the sweepings and covered not only the walls but the pictures, dishes, the bed, and everything in the room,—so virulent as to produce the disease several weeks after the patient had left the room. It is then from the dried sputa of consumptives that this great foe of the human race scatters its seeds. This is proved beyond question. These germs have been found repeatedly in the sputum, in the dried fly specks on the windows of rooms inhabited by consumptive patients, the flies having fed upon the sputa.

Animals feeding on the sputa of consumptives die of consumption. Dr. Cagny ‡ tells of a young consumptive who took care of a large number of fowls and who amused himself by coughing for the amusement of the chickens, which

GREEDILY DEVOURED THE SPUTA.

Many of the chickens died from consumption and the germs of consumption were found in the dead chickens.

Consumption has been produced by inoculating with the sputa, by swallowing the sputa, by breathing the sputa. The disease has been transmitted to cattle, pigs, sheep, rabbits, rats, mice, dogs, monkeys, and men.

When Tappeiner was causing dogs to

BREATHE THE PULVERIZED SPUTA OF CONSUMPTIVES,

a robust servant of forty laughed at the idea that consumption could be caught in this way. In spite of warnings he went into the inhaling room, breathed the sputum dust, and got the consumption just the same as the dogs. In fourteen weeks he died of consumption. §

Thousands in Michigan every year do unconsciously just what this man

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*Zeitschrift für Hygiene, Vol. V, pp. 191-331. See also references to this subject in London Lancet May 19, 1888; Phthisiology, Historical and Geographical, pp. 275-277; Fourth Annual Report State Board of Health, Maine, 1888, pp. 199-212; also Buffalo Medical and Surgical Journal, June, 1889, p. 639.

†Experiments by Graucher, mentioned in Centralblatt für Bakteriologie und Parasitenkunde, Vol. V, p. 280. Similar experiments with similar results were made by Cadeac and Mallet on rabbits. Revue D'Hygiene, Vol. X, p. 255.

‡Transactions of Congress for the Study of Consumption, Paris, Vol. 1.

§Buffalo Med. and Surg. Jour., June, 1889, p. 687. Dr. Gautier, a French physician, in similar experiments, accidentally breathed the sputum dust and contracted the disease. Science, Vol. XIII., p. 162.

did consciously and willfully; and when we think of the ten thousand consumptives in Michigan who every hour in the day are expectorating along our streets and even on the floors of public buildings, postoffices, churches, hotels, railroad cars, and street cars, when we think how these germs are being dried and carried into the air by every passing breeze, by every sweeping, and how they are capable of producing the disease six months after drying, when we think of the miscellaneous crowd sleeping in hotel bed rooms, when we think of the close, unventilated sleeping car with hangings and curtains so well calculated to catch the germs and where, as some one has said, the air is as dangerous as in those boxes filled with pulverized sputa where dogs are placed for experiment; then when we remember that man's lungs are a regular hot-house for the growth and multiplication of these seeds of consumption, is it any wonder that one citizen in every seven dies of this disease? And if a human life is worth anything to the State, is it any wonder that the State spends money to hold such conventions as this where the people may be told how they may destroy these invisible yet almost invincible germs swarming in the air we breathe.

DESTRUCTION OF THE SPUTA.

Now, the object of this discussion is not to make you afraid to breathe but to make you so dread the sputum from consumptives as to insist on its destruction. Every person after coughing a month or so and raising sputa, should have a microscopical examination of the sputa both for his own comfort and for the public safety. No consumptive should be allowed to expectorate on the floor or street, and all sputa should be disinfected or burned.* The disinfection of the sputa has been recommended by the American Public Health Association, by the Michigan State Board of Health and by many other boards, and if it were universally carried out there would be two or three thousand less deaths in Michigan every year.

But you say that you have not the consumption, you cannot go around seeing that your neighbor disinfects his sputa, are there no

PERSONAL PRECAUTIONS

which you can take? Yes! It does not follow because we breathe the germs of consumption that we will get the disease. Our lungs may be so healthy and vigorous that the germs will not find a congenial soil. Dr. Trudeau's experiments show that when animals are inoculated, if they are kept in good sanitary surroundings, the disease is sometimes arrested. So post mortem examinations show that a great many men and women are attacked by consumption sometime in life and they recover from it. They have such good food and air and their lungs are so healthy and vigorous that the tubercular process is stopped.† Consumption never attacks wild oxen but it is a great

*See addenda.

†"In more than sixty (60) per cent of the autopsies in the charity hospitals of New York, I have found, after death, in the lungs the evidence of a tubercular process that had existed at some time in life. This was manifested in the form of cheesy or calcareous masses, fibroid tubercles, or well marked tubercular lesions. * * * In a very large proportion of cases the process early becomes stationary and retrogressive. I have found that this was the case in nearly fifty (50) per cent of the instances of pulmonary tuberculosis, and that in every stage of the disease, up to the time when there were cavities in both lungs, with a large proportion of the upper lobe of the one lung converted into cavities, that the process may become stationary or retrogressive." Paper by Hermann

catch for tame elephants and pet canaries, for foreigners who try to accommodate themselves to the food and habits of another race. It yields a higher death-rate in the closely crowded cities, in the great industrial centres, than in the open country.* One-half of all the deaths which occur in States' prisons are from consumption † and Ziemssen says that imprisonment for fifteen years is equivalent to sentence of death by consumption.

Any environment which weakens the system or irritates the lungs simply

HARROWS THE SOIL

for the easier cultivation of the seeds of consumption. It may be the irritating dust from a factory, or it may be only a hard cold.‡ All of these unfavorable conditions you may avoid. You may strengthen the body in every possible way. You may go further:

Without considering the question at length, it is known that consumption is a very common disease in cattle and may be communicated to man by the milk which he drinks and the flesh which he eats. Now, you may boil all the milk § which is suspected, to destroy the germs, a meat inspector may destroy the flesh of all tuberculous animals ‖ and all of this will do good.

M. Biggs, M. D., Pathologist to the New York city health department and charity hospital, etc., in the Buffalo Medical and Surgical Journal, June, 1889, p. 643-644.

"In the autopsies made at the Philadelphia hospital it is surprising to see the almost universal presence of this disease in a more or less active state in patients dying from other affections, such as Bright's disease or Carcinoma. * * An abundance of examples of healed tuberculosis, as the puckered apices and the encapsulated nodules show, are constantly found." Address by J. H. Musser, M. D., before the Philadelphia Co. Medical Society, Dec. 26, 1888. Medical and Surgical Reporter, Jan. 26, 1889, p. 102.

* In Detroit the death-rate is higher than in the rest of the State. Dr. Flick, in a series of maps locating every death for 25 years in Philadelphia, shows that 28 per cent of the infected houses had more than one case.

† Hirsch's Hand-book of Geographical and Historical Pathology, p. 222.

‡ Dr. Henry B. Baker has shown by an immense number of statistics that there is most danger from consumption when the air is coldest and driest, and the lungs and air-passages are irritated or "chapped" as we say of the hands.

§ It is probable that the many cases of quick consumption in young children and of consumption of the bowels are to be explained by the large quantity of milk consumed. It was stated at the Paris congress that over two thousand children under two years of age die annually in Paris as a result of the *bacillus tuberculosis*.

The germs of consumption have been found in the milk from tuberculous cows, even where there was no evidence of localized tuberculosis in the cow's udder. (British Medical Journal, Jan. 5, 1889, p. 29.)

At the Paris congress for the study of consumption in man and animals, M. Nocard, of Alfort, stated that "it is necessary to act always in regard to phthisical cows, as though the udder were invaded by the lesion. * * * The only practical and sure means of rendering milk from tuberculous cows harmless is to boil it." ("Congress pour l'etude de la Tuberculose chez les hommes et chez les animaux" fasicule 1, pp. 49-58.)

Mr. P. Bang, of Copenhagen, (pp. 69-72, of the proceedings of the Paris congress,) stated: "From experiments which I have made regarding the influence of heat on tuberculous milk, I have found that in order to destroy the virus so that tuberculous milk will not, by inoculation, produce tuberculosis, it must be heated to 85 degrees Centigrade [185° Fahr.], but that the exposure of such milk during five minutes to a heat between 60 and 75 degrees [140°-167° Fahr.] so weakens the virus as to render it incapable of producing the infection through the digestive organ.

"I have made numerous experiments on the influence of heat on tuberculous milk. Exposing it to a temperature of 30 to 60 degrees Centigrade [80°-140° Fahr.] has not the least effect upon it; but a little higher temperature than that (60) [140° Fahr.] weakens the virus in a manner very evident; yet the milk, by inoculation, may still produce tuberculosis. * * * * In two series of experiments milk heated to 80 degrees produced tuberculosis by inoculation, but not in two others. Heating to 85 degrees [185° Fahr.] was employed in three series, and milk exposed to that heat proved innoxious. In two series I examined the influence of boiling, which sufficed for the destruction of the virus. The weakening of the virus under the influence of a temperature between 60 and 75 degrees [140°-167° Fahr.] is shown very clearly by experiments made in the alimentation of 18 rabbits, of which a few series lasted several days and a third for thirty months. Six rabbits which drank tuberculous milk uncooked, became tuberculous (four in the highest degree). Two drank the same milk heated to 60 degrees [140° Fahr.], two took it at 65 degrees [149° Fahr.]; of these four, two only (one of each series) showed light traces of infection. Six rabbits which drank the milk heated to 75 degrees [167° Fahr.] did not show the slightest trace of the disease."

Prof. Bang also showed that butter might be affected.

‖ M. Nocard, of Alfort, concludes from his inoculations of guinea pigs with the juice of the meat of tubercular cows that the use of such meat may be dangerous though such cases are rare. (Congress pour l'etude de la Tuberculose chez les hommes et chez les animaux" fascicule 1, pp. 49-58.)

At the same congress, V. Galtier, of Lyons, (p. 79) presented evidence that meat salted ten or fif

But more important than all this, more important than anything else—let me emphasize again in closing—the disinfection of the sputa.

The consumptive should do this for his own good, because, when he continues breathing the germs of consumption from his own sputa,

HE CONTINUALLY RE-INFECTS HIMSELF,

and thus diminishes his chances of recovery. But more than this the people should demand it for their own safety. It is more important than to fortify our bodies. It is better to kill the germs before they commence trying to kill us. You have probably heard of the Irishman who swallowed a potato bug and then swallowed Paris green to kill it. If a battle must go on with the germs of consumption, I prefer it to go on outside of my body, and the place to take the germs at a disadvantage is in the sputa.

This plea for the disinfection of the sputa may seem a rather prosaic and commonplace recommendation with which to close a long speech,—something like those long column articles in the newspapers, which picture the horrors of some disease and close with an innocent little line at the bottom, —"Use Warner's Safe Cure." But when I look at this diagram,* more eloquent than words, when I think of the thousands who every year are cut off in the prime of life, I sometimes feel that a man could not have a better epitaph written over his grave than this:

HE TAUGHT CONSUMPTIVES TO DESTROY SPUTA.

Every day in the week and every hour in the day one citizen in seven is giving to every passing current and to the four winds of heaven those seeds which surely mean a wrecked ambition and an early death to some fellow creature. Every hour in the day that great "reaper whose name is Death" is gathering with his sickle where we in our ignorance have sown the seed. And yet a nation which has spent thousands of dollars studying the diseases of peaches and pears, a nation that has spent thousands of dollars to protect its fish and the young seals of Alaska, has never given a dollar for the study or prevention of consumption in men. If Jefferson and the signers of the Declaration were right, and the first object of government is to guarantee to all men the enjoyment of life, surely that work is highest and noblest whose object it is to prolong the lives of millions and to endow those lives with health and strength.

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teen days produced consumption in guinea pigs on inoculation, the virulence seeming to be in inverse ratio to the length of time the meat had been salted.

The congress voted almost unanimously that the flesh from tuberculous animals should be destroyed where the disease becomes generalized or even when localized, if a large part of the organ is affected, as the baccili may be carried to different parts of the body by the blood, the lymphatic stream or what Koch calls the "wandering cells," even when the tubercular process is only "local."

These conclusions were at once adopted by the French government and the destruction of such flesh is now required by law.

* On page 28.

ADDENDA.

PREVENTIVE MEASURES.

Every person, after coughing a month or so and raising sputa, should, for his own comfort and the public safety, have a microscopical examination of the sputa to make sure whether it contains the germs of consumption.

No consumptive should be allowed to expectorate on the floor or street.

Cuspidors in hotels and other public places should be partly filled with water. They should be washed twice a day in boiling water and the contents should be disinfected with a solution of bichloride of mercury.

Where there are no cuspidors, sputa should be received on cloths, which should be placed in an envelope for the purpose and afterwards burned.

All sputa from consumptives should be disinfected or burned.

No person should sleep in the same room with a consumptive patient or in a room which has been occupied by a consumptive, unless the room has been previously disinfected with the fumes of burning sulphur.

The floors, walls, and furniture of a room occupied by a consumptive should frequently be thoroughly cleansed.

The clothing of consumptive patients should not be washed with other clothing.

Milk from an unknown or suspicious source should be heated to the boiling point before use.

Meat from animals affected with tuberculosis should be destroyed,* and all meat from an unknown source should be thoroughly cooked.

Everyone should sleep in a well-ventilated room, and take some active physical exercise each day. This precaution should be taken especially by consumptives, and if the employment is in-doors it should be changed, if possible, for some out-door occupation.

ADDRESS OF HON. C. G. LUCE, GOVERNOR OF MICHIGAN.

Mr. Chairman, Ladies and Gentlemen:

Calling on me to follow that inspiring song so admirably rendered, was a happy thought upon the part of those who arranged this program, and I am personally grateful for this arrangement.

Now, when I was invited to come here, I could not, nor can I now see any particular necessity for my appearing before you. You are here now to find all the scientific and practical truths in relation to disease, and the cause, and prevention; and I do not think that I ought to undertake to add one single thought; I am sure you have got as much as you can sleep on in

* The law in this State prohibiting the sale of diseased meat is as follows: Selling unwholesome provisions without notice.
SECTION 1. If any person shall knowingly sell any kind of diseased, corrupted, or unwholesome provisions, whether for meat or drink, without making the same fully known to the buyer, he shall be punished by imprisonment in the county jail not more than six months, or by fine not exceeding two hundred dollars.—§9316, Howell's Statutes.

relation to these things. I could not, if I would,—why, I do not understand the medical terms, many of them, used here tonight. Now, when the Secretary of this Board of Health invited me to come here, I was somewhat reluctant, but as he lives at Lansing he has found out my weak points and blind side, and insisted that I must come here, and fetched me by saying, "You are to assist in bringing out an audience for us to punish," and this was the chief argument that induced me to come. (Applause) And I am now glad I came and shall claim credit for the attendance of this magnificent audience that we see before us tonight. And another thought, the Board of Health is a department of the executive branch of our State government,—it is created by law and the Governor is made commander-in-chief not only of the military but medical forces of the State, so far as they relate to the Board of Health, and I have been out with them before, as I wanted to see if they are earning their money and are rendering value received for the expenses they make. I have gone out as a matter of duty as well as of pleasure, in this as in other cases, looking after the several departments of the State government. Now, I am told that I am to talk to you upon the relations of the State to the health of the citizens.

First of all, what is the State in this connection? We often talk of the State and its developed and undeveloped resources, but for our purpose tonight the State means you, and as such I will treat it. I am going to reason by analogy or comparison and not undertake to submit any logical arguments, but a statement of facts relating indirectly at least to the health of the citizens. In the brief moments I have had to consider what to say, a few recognized truths, well established and understood, have occurred to me, and from these we may draw lessons that will bear upon this subject. I have talked long enough to learn that no great influence is likely to be exerted upon communities by any efforts of mine. Day before yesterday I talked to a house crowded with farmers, upon the subject of agriculture, and still that audience will doubtles go away and farm just as they did before. Last night I talked upon American citizenship in a church at Dansville, and those who listened to me will doubtless remain just exactly such citizens as they were before. So I have never dared to hope that words of mine would influence to any great extent. I have often found that I could amuse, but this would hardly be proper here in a church.

Now there are certain established truths that we all understand, and my young friend, Mr. Clark, alluded to one of these in his closing. We do expend as a State, as communities, enormous amounts of money, energy, thought and everything else that goes into the expenditure of efforts for the protection and promotion of the health of our domestic animals. What is it that induces us, what is the motive that impels on these gigantic efforts to save our horses, cattle, our hogs and our chickens, and other property generally? What is it that inspires men to think and to move and to act as they do in relation to these subjects? Why, I am almost afraid some of you will rebel when I state what I think it is. I suppose if we were to go around and ask the individual ladies and gentlemen of this audience, that their answers would be about as varied as the number in this house, but in an enlightened christian, civilized country and community the highest motives that actuate are selfishness and self-interest. Deny it if you may, observation, enforced by the record, will prove that these are the motives that impel men and women on in the race of life.

It is the inspiring motive that influences States in the enactment of laws, in the expenditure of money and of vital forces. And when properly exercised this is all right and proper. I have no desire to stimulate individual selfishness in the heart of any man or woman, no desire to induce any one, or to say a word here or elsewhere to induce any man to accumulate more money solely for his own personal benefit or aggrandizement, but enlightened self-interest that takes in communities and the State, that aids in ennobling it, lies at the foundation of the progressive civilization of the age in which we live. To illustrate: It has become the settled policy of this State and country to educate all the boys and girls and thus elevate them to the highest possible standard. Men place their hands in their pockets and cheerfully draw out their money to aid in the construction of magnificent school-houses. Now, why do they do this? What is the motive, what element of civilization has compelled us to recognize the great truth that we must educate the citizens? Why, it is this enlightened selfishness—this self-interest, self protection and promotion of the best interests has induced us to do this. And why? Simply because the educated citizen is more valuable to the commonwealth than the uneducated, and so we take the poor boy and give him the same opportunities that the sons of the rich enjoy to secure an education, and all at public expense. It has been for the *State* that we do this. This State of ours reaches out its generous and paternal hand and constructs large edifices and houses in which to take and care for the unfortunate and homeless children. Now, I have no desire to ignore or underestimate the humane motives which impel men and women onward and induce them to make generous and heroic efforts for their fellows. I would rather encourage them, but am now talking about practical facts that have been forced upon me by careful observation for many years. Humanity and sympathy enter into this action to some degree, but we educate these waifs that are found around in dry-goods boxes, alleys and streets, and suffer them not to grow up in ignorance or want; we take them and place them in the home at Coldwater, where we have provided for dependent children, and humanity may have something to do with this, but it is not the prime motive, this is really to protect and to promote the safety, happiness and best interests of the State. We take the boys that are running around in the streets of the cities and place them in this home and others; employ the best superintendents and teachers that we can find, to make of them excellent men who become strong and intelligent citizens of the State, and this is largely dictated by this enlightened selfishness of which I have spoken. It is done that we may promote the general good. We go through the category of legislation and of appropriations and we find this truth illustrated in most of our appropriation bills. Well now, what has this to do with the health of the people? These illustrations might be multiplied indefinitely, but as they will not be disputed there is no use of arraying them before you. We all understand that it is more profitable to the State to educate these children, as a money investment, and this is eminently true when we apply the same principle to the health of the people. For the purpose of conferring a benefit upon the State, the Board of Health has been established and is maintained. A human life has a value to the State. It has been demonstrated by statisticians that the real value of all the citizens that have been born in America during the lives which they have lived, is about a thousand dollars each; that they have been worth this to the State

as wealth producers. This was about the market value of the slaves in the south when slavery existed. Do not be alarmed, we are not going to offer you for sale in the markets of the State; but the truth remains the same notwithstanding this fact. This being so the State is financially interested in the health and in the lives of its people, so that if measures can be adopted, if facts can be presented, if influence can be exerted upon the individuals that will secure a higher degree of health and increase their strength and vigor, the State is closely allied to and interested in these efforts and money expended in this direction, as adding wealth, comfort and happiness to the State.

We all know that the strong robust man or woman is a better and more productive wealth producer than the sickly, feeble one. Following out this line that I have laid down, whether it harmonizes with your views or not, the enlightened selfishness of the State can be as properly extended in preventing sickness, disease and death as it can in educating the children of the State. Now, I have not paid much attention to medicine or the practice of medicine; I have devoted my best thought and a good deal of time in keeping out of the hands of the doctors, and have succeeded admirably so far during the years that I have lived, and all of you ought to do the same thing, and I will agree that the doctors, as a rule, are in harmony with these views. There is once in a while a doctor who wonders what on earth people keep well, sound and strong for. Why do they not need my services? I once asked a very excellent doctor after the health of the community. He had a sad, far off look, and replied, "It is distressingly healthy;" but this is not a common sentiment, and I don't know that it is his, but he staggered me with the words "distressingly healthy."

And now, to go back, the State is under obligations to every single individual, the humblest as well as the lofty, the poor as well as the rich, to make every effort within its power to promote the health of the citizen. And for this purpose thousands and millions are annually and legitimately expended. I am not going to tell you that the Board of Health has accomplished all that it could, or can, nor will I stand here and claim that it has adopted the best method that might be devised by the ingenuity of man, for I do not know, but that it is reaching out in the right direction, I verily believe. If it is not, I want my successor to make changes in the personnel of the Board of Health, because it is engaged in a very important work that should be accomplished in order to secure to the people this robust health, so far as possible, without which life has but few enjoyments.

I have been on the railroad for the last two or three days traveling around from place to place, and have passed many railroad stations, and at nearly all of them were seen piles and piles of barrels of apples, and they are now bringing a pretty good price, they tell me. We passed one station and while the train stopped I counted the barrels and found there were about a thousand barrels of apples at that one depot. I suppose they were worth pretty nearly two dollars a barrel, or two thousand dollars in all. They doubtless belonged to different members of the community, and they probably were not insured. Now, if by accident those barrels should be burned up at that depot and the apples roasted, they would be a total loss to the owners; not only to the owners, but the State of Michigan would be just that much poorer than it was before, as so much wealth would be wiped out. Well now, reasoning from the statement that I made, it would inflict upon the State

a corresponding loss if two citizens should die unnecessarily, or their health and strength be impaired so that they would no longer be wealth producers. In one case we see the loss very plainly; in the other it is not quite as apparent, but it is just as true. Many other illustrations might be presented to prove to the skeptical (if any there be), that the State is interested in each and all of its citizens, and in their lives and in their health.

If consumption is contagious, and if precautions can be used so that two individuals escape this dread disease, it will save to the State in dollars and cents the same amount that it would to prevent the loss of two thousand dollars worth of live stock, or other property. I do not know anything about the probable cause, cure and prevention of consumption. I did not know before listening to my young friend that consumption was so contagious, but I know many other diseases are. There is typhoid fever, diphtheria and scarlet fever, but I see on that diagram that consumption leads them all in its prevalence and fatality. If means can be suggested that will prevent the spread of diphtheria or small-pox and save the lives of two children, we would save just as much as those farmers would if they save the thousand barrels of apples destroyed by fire.

We cannot fail to see that the State is intimately related to the health of its individual citizens, and in discharging its duties should use all reasonable efforts to protect their health, and I am glad that these boards come together and draw from the records of a thousand years' medical practice and discovery in order to present these truths to us.

I was sorry that Dr. Lyster and my young friend Clark did not go on and consume all the time allotted to discussion, for I would much prefer to have listened to them than to have talked myself. They are competent to instruct you in relation to this matter. But, for all that, I was willing to come here to draw a few conclusions and state a few facts that might lead us to believe that you and I are interested in the citizens of the State; in the welfare and health of the people, and to urge upon those who are skilled in the work to provide the means (not the money now), but the ideas and the facts to better enable us to protect ourselves from disease. Now there is another thing that I want to call your attention to for a moment. I went out with this board to attend one of their conventions at Tecumseh. Upon that occasion I had prepared a written paper, but I do not want to repeat it here as a whole, but a thought contained in that paper, I desire now to present. We have a State Board of Health and we have local boards and we have laws requiring action on the part of these boards. Now when a contagious disease breaks out, one of these universally recognized contagious diseases, it is a duty you owe to the State, as a citizen of the State, to help the individual members in operating the machinery and in enforcing the laws that govern the action of the boards of health. This is not done as freely as it ought to be. And often cases come to my attention where contagious diseases spread, causing sickness and death unnecessarily, because the board of health did not obey the laws that had been enacted by the legislature to aid in protecting and promoting the health of the citizens.

I remember that last winter, I think it was, the small-pox broke out at Lansing. This is not a very pleasant disease and those who have had it are wiser, but they are seldom as handsome as they were before, and we desired to prevent the spread of this loathsome disease. The local board of health and the authorities were lax in enforcing the law, and I was entirely out of

patience with them, because they were fearful that they might possibly hurt the business of the town if heroic measures were resorted to. This is all wrong; it is a fallacy to suppose that by partially suppressing information in relation to the extent of contagious diseases that the business of a town may be benefited thereby. It is much oftener an injury, because exaggerated reports gain credence outside of the village or city. Fellow citizens, you live in one of the brightest towns of the State, and one that is reasonably prosperous. Don't believe, for a moment, that if the small-pox ever breaks out in this town that you can smother the information. Indeed, you have no right to do this. You should give information to the health officer, and your local board of health should resort to vigorous measures to prevent the spread of contagious disease.

In a small village in Monroe county the small-pox spread to a frightful extent last winter; business of the town was, for a time, paralyzed; lives were lost, and all this was caused largely by the fact that the attending physician and the chairman of the board of health kept declaring that there was no small-pox existing in the village, and for this reason people were lulled into false security until it existed in almost every house. The State, itself, paid a portion of the expenses, for, as I said, the State of Michigan is interested in the health, strength and welfare of the humblest boy or girl, man or woman that resides within its borders. It wants to assist them, and it ought to, because we are financially and otherwise interested in the health of all, and besides, the sentiments of humanity dictate that we should relieve their suffering.

I am glad that you came out, and I want you to take the medicine these doctors have given you; take it home, digest it, study it, ponder over the truths which have been presented to you, and see if some benefit cannot be derived from holding this sanitary convention here under the auspices of the State Board of Health. I will now leave you in the hands of the Board.

Third Session—Friday, Oct. 18, at 10, A. M.

After a vocal selection by Mrs. J. H. Simonds, the following paper was read:

THE CAUSATION AND PREVENTION OF INSANITY.

BY C. B. BURR, M. D., SUPERINTENDENT EASTERN MICHIGAN ASYLUM FOR THE INSANE, PONTIAC.

In discussing the theme which your committee assigned me, I stand in no fear of incurring the dangers which beset the pioneer. The route which I am to pursue is no obscure trail leading into the unexplored recesses of the primeval forest, but a broad path worn by the tramp of many feet. The changes have been rung upon my text until the echoes are wearied and have retired from active service. The soil upon which my labor is expended has been well cultivated in the past, and its crops threshed and rethreshed and threshed again. I hear the rustling of the musty draperies upon the mummified bones of my subject as I expose it to public view. I crave your indul-

gence, therefore, if my paper lacks novelty, freshness and vigor. My apology for presenting it shall be, that the frequent repetition of homely truths often serves the better to impress them.

Experience has taught that it is difficult for the average individual to regard insanity as merely an expression, more or less profound, of perturbation of function of the organ of the mind (the brain). He is wont to look upon it from a different point of view than that habitually maintained toward symptoms of disease in general. I apprehend the distinguished legal gentleman, known by reputation at least to everyone within the sound of my voice, would hardly have said of the delirium of fever that it was "volitional;" but such was his attitude toward an allied cerebral disorder that he proudly affirmed, felicitating himself upon the novelty and originality of his proposition, that "all insanity is volitional."

What relation does the preservation of the public health bear to insanity, and are its causes and the prevention of insanity proper subjects for discussion in a gathering of this nature? To this I would reply unhesitatingly "yes"—the ultimate causes of insanity being those of disease in general, and largely preventable. The element of mystery which for ages surrounded insanity, its causation and development, is being dispelled by the broad light of modern scientific investigation. Undoubtedly an exaggerated idea exists as to the part which emotional causes play in the production of mental disease. Were this not true, we who are engaged in the specialty of psychiatry, would, I apprehend, hear less frequently than we do the doubts and forebodings our neighbors express concerning our ability to withstand the influences of long association with the insane.

Mental disease is frequently the result, directly or indirectly, of the conditions which impair the general nutrition, and as such, becomes an appropriate topic to present to a sanitary convention. Unsanitary surroundings, exposure to the contagion of communicable diseases, labor in narrow and ill-ventilated apartments, intemperance, excesses, and other causes which engender bodily illness, are indirectly responsible for the existence of an incredibly large percentage of insanity. With all these "first causes" as it were, the sanitarian has to deal.

In tables of causation, under the single head of "ill health" (physical), are comprised ten per cent of all cases admitted to the Eastern Michigan Asylum since its organization in 1878. Of this number, many patients suffered from tuberculosis in its various forms, and their insanity was directly attributable to such infection. This protean disease, as you are aware, is now, thanks to modern bacteriological investigation, relegated to the class of communicable diseases. Isolation of patients affected with tuberculosis, attention to the rooms, the bedding and the utensils employed in their care, the prevention of the dissemination of the microbes which occasion this malady, must eventually diminish its ravages, prolong the measure of human life and decrease insanity.

Two patients out of the whole number admitted, suffered from insanity due to eruptive fevers. We are well aware of the communicability of diseases of this nature, and have also been told how their virulence and prevalence have diminished through the measures adopted by health organizations looking to their extinction.

Other diseases of a contagious and communicable nature are responsible for at least three per cent of all cases of insanity under treatment in the

Asylum. While the problem of the restriction of the particular maladies alluded to, comes for its solution largely within the province of the minister, the moralist, the physician, the teacher, and those who form and train the minds of the young, it is not amiss to briefly touch upon the matter in a gathering of this kind, merely adding the recommendation that more efficient laws be enacted and enforced for the suppression of vice.

Another cause of insanity, with which the practical sanitarian as well as the moralist and teacher are much concerned, is that of intemperance. In the recognition of this as a public evil, and in attempts to suppress it as a potent cause of ill health and insanity, the sanitarian is not exceeding his legitimate functions. At least in the forming of a public sentiment which shall sternly discountenance intemperance in all its forms, he has an individual responsibility. I would stigmatize as outrageous and unjust the clap-trap of the professional reformer who would have us believe that nine-tenths of all insanity is traceable to intemperance; but its importance as a causal factor in mental maladies should not be ignored. From eight to ten per cent of cases of insanity doubtless owe their development to the habitual and intemperate use of alcoholics, the preparations of opium, and other narcotics.

On the other hand, the so-called emotional causes of insanity, as business perplexities, disappointed affections, domestic trouble, grief and anxiety, homesickness, popular errors and delusions and religious excitement together comprise a total of but twelve per cent of admissions; while of these about one-third of all patients have their mental trouble ascribed to grief, care and anxiety, causes which lead to mental disorder through deprivation of sleep, disorders of appetite and digestion, and other conditions purely physical.

In the above discussion of causation, much appears and more is implied which refers to the second part of my subject,

THE PREVENTION OF INSANITY.

What can be done to place our citizens under more favorable conditions for withstanding the influences which produce disease of the mind? Obviously much may be accomplished by strictly observing the rules of hygiene and living in accordance with the laws of health. Intemperance in eating and drinking should be shunned, our homes, offices and workshops should be well lighted and ventilated. Our hours for labor should not be too long, nor should we permit in our haste to perform the large amount of work which our American methods enact, the deprivation of that needed rest today which restores the brain and fits it for the work of the morrow. The annual vacation should be taken by everyone engaged in active work. It brings relief from the cares and perplexities which surround us in the struggle for existence, brightens our horizon and changes the trend of mental action.

We should co-operate with all well directed efforts to improve the sanitary condition of our communities, to prevent exposure to deleterious influences and contagious principles which, acting upon the brain, occasion those perturbations of function known collectively as "insanity."

I would fain speak also of the danger which lurks in ill-assorted and inharmonious marriages. In no other class of diseases is the so-called

"hereditary tendency" so strongly marked as in those affecting the nervous system. It is fitting that marriage, the most important step in life, be entered into only after mature reflection and a clear recognition of the evils threatening the offspring of those suffering from neuroses or mental disease. But for hereditary predisposition to nervous disorders, the inheritance of the so-called "capacity for insanity," the particular disturbing influence which is but one link in the chain of causation, loses much of its force and may perhaps be withstood. The trials of life, the vicissitudes of fortune, the loss of position, may not then, as is too frequently the case where a neurotic constitution exists, suffice to overthrow the mental balance.

Finally each one of you may assist in the prevention of insanity by using his influence to place the insane sufferer under proper curative treatment while his malady is yet in a curable stage. The burden of chronic insanity is increased by delayed treatment. The well-being and mental health of other members of a family, the comfort of a home, the safety of a community often demand the early sequestration of the insane person. Sentimental considerations should not deter us from doing our obvious duty in such cases—that of assisting the friends of a patient to the reasonable acceptance of a most difficult and painful necessity.

Table showing the deaths from tubercular disease, by years, in the Eastern Michigan Asylum.

Year.	Whole number of deaths.	Deaths from phthisis, tuberculosis of the lungs, bowels and other organs.	Or one in
1878	3	0	.....
1879 and 1880	51	0	.....
1881	35	4	8.75
1882	36	6	6.
1883	42	6	7.
1884	29	7	4.142+
1885	52	7	7.428+
1886	32	3	10.666+
1887	28	3	9.333+
1888	56	2	28.
Totals and average	364	38	9.57+

CONSUMPTION: ITS CAUSATION AND PREVENTION.

BY FRANK W. BROWN, M. D., OF DETROIT.

Someone has said, in effect, that to reiterate an all-important old fact is sometimes quite as praiseworthy as the discovery of a new one. If this be true, the paper I have the honor to present to you today may be of some value, for, although I have nothing very new to offer for your consideration, yet the subject is of such transcendent importance that its various phases will bear many repetitions.

Pulmonary tuberculosis or consumption (chronic pneumonia, fibroid phthisis, gangrene, etc., excluded) is one of the most wide-spread and fatal of diseases, about one-seventh of all deaths, the causes of which are recognized, being due to it. It is difficult to realize what this percentage means. Salmon* has estimated that over 131,000 deaths occur yearly from consumption in the United States, an estimate rather under than over the mark. This means nearly fifteen deaths hourly, or one every four minutes. But its prevalence cannot be measured by its percentage in the death lists, for post-mortem examination of cases dead from other diseases has shown that tuberculosis, though not even indirectly the cause of death, was or had been present. Loomis† states "that he had found in no less than 60 per cent of all patients dying in Bellevue Hospital, there were old tubercular changes in the lungs; the disease having been recovered from." But tuberculosis affects other organs than the lungs and in localities not always investigated post mortem. Estimating and including these, it may be asserted, I think, that tuberculosis is much more prevalent than is generally supposed.

The importance of a knowledge of the causes and prevention of such a terrible disease, a disease which may be said to be perpetually epidemic, cannot be over-estimated, and this knowledge has been sought from the earliest times, but without success, until Robert Koch, in 1882, completed and gave to the world his masterly investigations which discovered that microscopic, vegetable parasite called by him the *bacillus tuberculosis*. His work partakes of the conclusiveness of a mathematical demonstration; and, although his conclusions were vigorously assailed by well-equipped antagonists, the result has been that, almost without exception, these numerous assailants have become his most powerful defenders.

Villemin, in 1865, had shown that the inoculation of tuberculous matter was followed by a general tuberculosis. Koch working on this hint, and assuming that a special organism was the cause of this infectiousness, after two years' labor and by methods which I need not detail here, succeeded in isolating his bacillus. Obtaining a pure culture of the germ, freed from all matters from the original source, he found that inoculation was followed by tuberculosis, and he has further shown that all true tubercles must contain the bacillus or its spores.

The *sine qua non*, then, the sole direct cause of consumption is the bacillus tuberculosis and it must not, therefore, be forgotten that the popular idea that consumption may arise as the result of a "cold," a bron-

* American Public Health Association Vol. xiv.
† Journal of the American Medical Association, Vol. xii, No. xx.

chitis or a pneumonia, is founded in error. There is no doubt that these latter diseases may create conditions favorable for the growth of the bacillus, but such is not often the case,* and then only in certain individuals who have a predisposition to consumption. This predisposition is derived generally through inheritance, and sometimes it is acquired. It seems to me that the laws of heredity assure us that this predisposition should not be considered as a fancied state, created as a padding for a theory or as a cover for ignorance, but rather as a real condition, which forms a subsidiary though not necessary factor in the causation of the disease.

In just what this predisposition exists we do not know. Whether it is that the spores of the bacillus have lain dormant in the individual from pre-natal times, having migrated from the mother's blood or been instilled through the male element awaiting a favorable opportunity for growth, or whether it is an inherited or acquired weakness of the organism especially manifested in those amœboid cells which cover the various mucous membranes, the so-called phagocytes of Metschnikoff, one of whose functions is to devour invading microbes, we cannot say. But whatever may be our theoretical doubts,—and I do not see how it is possible to doubt—as to the existence of this condition, it is certainly safer for us to assume than to deny its entity.

The factors, then, in the causation of consumption can be paralleled with those necessary for the growth of a plant, *i. e.*, the proper seed, placed in the proper soil and surrounded by the proper conditions for growth. The seed of the disease is the bacillus tuberculosis, the soil is an animal body sufficiently non-resistant to the microbic invasion, and the conditions are moisture and an equable temperature of a degree such as exists in the animal.

In working out the problem of the prevention of consumption we must endeavor to accomplish two things: (1.) To destroy the bacillus, and thus prevent its entrance into the body, and (2) to strengthen the tissues that they may resist and destroy the microbe when it is successful in gaining lodgment within the body.

In order that we may be able to destroy the bacillus it is necessary that we should know where it is found. The microbe is found most abundantly in the sputum of those suffering from pulmonary tuberculosis. It is of importance, then, that the sputum of individuals thus infected should be carefully collected and scrupulously destroyed at short intervals. Fire or boiling water is the best means of destruction. It is not from the sputum as collected, but from the dessicated material that the greatest danger is to be feared. Dr. Richard * in a paper read before the *Societè de Medicine Publique* three years ago, draws the following vivid picture of the dangers from the infectious tubercular dust:

"The expectoration begins to be really dangerous when, in the effort of coughing, through awkwardness or heedlessness, it is projected upon the bed, the clothing, the bed clothes, the walls, the floor, or when it is received in the handkerchief. Then rapidly drying, it becomes friable, is pulverized and disseminated, and henceforth the atmosphere of the room may be considered as virulent for a long time. The sputum falling on the bedding, the mattress, sheets, blankets or on the handkerchief, once dry, is detached at each movement of the patient, and especially when the bed is made, it goes

*Flint. Pepper's System of Medicine, Vol. III.
* Report of Maine State Board of Health, 1889.

to rejoin that portion which has been launched directly upon the floor, and that which, after dessication, has fallen from the walls. All is trampled under foot and is reduced to a powder finer and finer. This infectious powder goes and comes; the currents of air, the frolics of children, the strokes of the broom raise it and make it float in the air where it remains suspended awhile to finally fall on the bed, the furniture, the walls, the floor. That part which is taken up by the bed is the most stable; the woolen blanket or coverlid is like a sponge which stores up the powder with prodigious facility, that of the furniture and walls is displaced often, and each time it is raised a new portion goes to increase the store which is in reserve in the blankets, which finally may be considered as the natural reservoir of all the powder in the apartment."

This picture is not altogether a fanciful one, for it has been shown by Dr. George Cornet* that, although the bacillus is not ubiquitous, it is found in a large percentage of cases in the dust of rooms inhabited by consumptives who were careless as to the disposition of their sputum. He succeeded but once in finding the bacillus in those cases where the patients had been careful to use spit-cups and to see that they were properly cleansed. Spit-cups, therefore, should always be employed. The breath of consumptives is innocuous, but it is best that direct contact, such as kissing, and indirect contact, such as drinking out of the same vessels, etc., should be avoided, particularly by those predisposed to the disease. Patients should, when possible, occupy separate rooms, and it is of the highest importance that they should have their own beds.

The next most important habitat of the germ is milk, particularly cow's milk. Investigation has developed the fact that from 2 to 4 per cent of all cows are tubercular, and milk taken from them and used, without proper precautions, as a food for infants, is exceedingly dangerous. All milk should be boiled for five minutes, which serves to kill the bacilli with surety. Although the bacilli have not yet been discovered in human milk, excepting in those rare cases where the breasts were affected with tubercular disease, it is advisable that consumptive mothers do not nurse their offspring. In regard to meat from tuberculous animals it has been decided that if well cooked it is free from danger.

The second factor in the prevention of the disease—the strengthing of the tissues in order that they may attain greater resistance to the microbe—is more difficult to deal with. The most important question under this head is that of heredity. Statistics tend to show that a hereditary tendency can be traced in about 30 per cent of all cases. The old idea that the disease itself is the hereditary feature is seldom realized; it is the predisposition—a peculiar, inherent weakness—which is transmitted. The only way to prevent the handing down of this predisposition is so simple that I almost hesitate to mention it; it is that the man or woman suffering from consumption or having a well-marked, inherited tendency to the disease, ought not to marry. In this relation tuberculosis is almost as bad as syphilis. The monstrous disregard of the health and happiness of future offspring, not to speak of the community, shown by many physically diseased, though otherwise apparently refined individuals when about to marry,—a disregard which leads them to scorn not only their own future beatitude, but, what is far more important, the happiness of others, is too well known and unfathomable for comment.

*Zeitschrift f. Hygiene, vol. v.

To eradicate consumption by a practice of self-denial is impossible until we hold higher ideals of duty. Man will probably continue to mourn the loss of some of his loveliest and dearest ones from diseases for which he himself was responsible, and on such occasions will offer prayers for consolation which to me are indistinguishable from blasphemy.

The acquired predisposition is created generally by a combination of confinement, over-work, bad hygienic surrounding and malnutrition. Of these the most important are confinement and malnutrition. The remedy can here be sought in an avoidance of the causes.

When the predisposition exists, either inherited or acquired, everything that good hygiene can suggest should be employed to strengthen the tissues against the disease. Good, wholesome food, pure air, suitable employment, proper gymnastics etc., should be sought.

In conclusion, let me say that if I have succeeded in impressing upon you what seems to me to be the fact, that consumption is to a great extent a preventable disease; and that cleanliness and care in the handling of patients and their sputa are the most potent factors in the prevention, I shall be satisfied with my efforts in drafting the paper you have so kindly asked me to present before you today.

FIVE MINUTE TALKS ON SANITARY SUBJECTS.

REMARKS BY DR. J. W. SEELEY, PONTIAC.

Truths have been presented at these meetings which, if they were put into practical use, ought to be a benefit to the citizens of Pontiac.

There have been a great many points discussed in regard to health, in these meetings. But there is one point to which I would like to call the attention of the citizens of Pontiac, and that is this: Within one hundred yards of where I stand there is a beautiful edifice known as the Oakland county jail. Now, the sewerage of that jail is in a deplorable condition, and I do not know as it would be out of place, if it would not endanger the health of these physicians, to make a visit to the jail. Now, I am informed that the sewer that leads from that jail to the river takes a right angle, when it should be on a curve. The sheriff of Oakland county informs me that, at times, the effete matter which should pass off into the river below here, becomes stopped up so that the floor of the basement of the jail has been completely covered with that filthy matter. It is a self evident fact that we have no right to arrest people, no matter whether they are guilty or innocent, and compel them to be confined in our jail. You or I, at any time, may be arrested under circumstances that we cannot control and be confined there. Would it not be in order to ask our Governor to call an extra session of the State legislature, and for this purpose? You are all aware that there is at present a law in existence whereby a bounty of three cents is given for the killing of English sparrows. Now, would it not be a good plan to amend that law so that three cents bounty be paid for killing the bacteria which, next July, would be about as big as an English sparrow, and the boys with their air guns could make a good thing by shooting the bacteria in our jail.

REMARKS BY A. ARNOLD CLARK, LANSING.

This is a great age for conventions, as you all know; they have butchers' conventions, brewers' conventions, lawyers' conventions, ministers' conventions, editors' conventions, sanitary conventions and insanitary conventions. I read the other day of a convention of dancing masters. There is an association called the "National Toothpick Association of the United States." Then the undertakers have their conventions to discuss the best methods of disposing of us after we are dead. Surely, then, these doctors have a right to get together and tell us how to prevent disease and live long.

Hawthorne once told his mother that he could not be a minister and live on people's sins, or a lawyer and live on their quarrels, or a doctor and live on their diseases. Now, if it is true that doctors live on other people's diseases, certainly they are noble and patriotic men who are doing so much to prolong human life and prevent sickness, and thus ultimately do away with their own employment.

We owe very much indeed to these doctors who in laboratory and study are doing so much to prevent disease and prolong life,—to Koch who has found the germ of consumption, to Pasteur who has found a prophylatic against hydrophobia, to Jenner who has found a preventive of small-pox. We should feel toward all these men as Napoleon felt when Jenner petitioned for the release of two English prisoners. Napoleon was about to deny the petition when Josephine mentioned the name of Jenner, and Napoleon replied: "Aye, we can refuse nothing in that name."

And yet, the prevention of disease rests with you, the people. Communicable diseases destroy thousands of lives in this State every year, not because scientific men have failed to find the way to prevent them but because this knowledge is not generally distributed among the people. Before the Michigan State Board of Health was established there was hardly a local board of health in this State in active operation. Today there are fourteen hundred local boards making active efforts to prevent disease. In 1872 there were over three hundred deaths from small-pox in this State in only three outbreaks. In 1882 (owing to the excessive immigration in that year) there were over sixty outbreaks of small-pox and yet only one hundred and fifty deaths. That is to say there were thirty times as many centers of spread,—thirty times as many chances for small-pox to spread in 1882 as in 1872, and yet there were only one-half as many deaths, because the disease was so carefully guarded. These local boards were urged on in their work by the State Board, but still the success of the prevention was largely due to the local boards.

With these thoughts in mind, I hope that this Convention will lead to the formation of a local sanitary association in this city. Such an association might be of great aid to the local board of health, to the State Board of Health and to the entire city.

Such an association might be made a very pleasant social organization. It should include doctors, ministers, lawyers, teachers, and all those in any profession who value human life. Your association might well be divided into four different sections,—each section supplying the program for one evening in the month. You could have a section on water-supply, a section on the hygiene of schools and public buildings, a section on epidemic diseases, a section on legislation. Let each person join the section for which he is

best fitted. Divide your meetings into three sections. In the first part of the evening have a paper on some recent discovery in Sanitary Science or a review of the proceedings of some National Sanitary Association. For example, a paper might be read embodying the conclusions reached by the Congress at Paris for the study of consumption in animals and man; or not to go abroad—there is enough happening in our own country or even in our own State in a sanitary way every week to furnish material for an instructive paper. Whoever is to present the paper might write to the office of the State Board of Health for all the latest articles bearing on the subject of his paper and he would be liberally supplied.

Then a certain time might be devoted each evening to subjects of local sanitary interest and then close the evening program with a short social.

You might even well afford to rent a room for your meetings and in a short time, by correspondence with State and city Boards of Health, you could get together a valuable library on Sanitary Science.

Such an organization might put on record many, many facts of importance in connection with the modes of spread of communicable diseases which would otherwise be lost, and not only in the gathering of information but in the spread of information much good would result.

These communicable diseases which we know how to prevent, which cause one-third of all the deaths in this State, will never be prevented as they should be until the people generally understand and appreciate their danger. Slowly this change is going on. Sidney Smith said that all nations of men began existence in the pig-sty, that the kings were the first to get out, next the nobles, and last of all the people. At the time of the black death the houses of Europe consisted of one room built of stone—no mortar, no window, no chimney, no pillows, no bed, no floor. The filth was left to accumulate on the ground where the inhabitants slept. When this filth became unbearable it was covered with a layer of rushes, and then with other layers. In the large cities it was not safe to pass along the streets at night for fear of being deluged by slops from the windows. It is said that the streets were often so narrow that people could shake hands from the windows of houses on opposite sides of the street. And when the black death swept over England only one in ten was left alive.

Even in the seventeenth century the average man only hoped to live to be twenty-four years old. Now he may live to be fifty, while scientists tell us that if we lived as we ought to live, that if we prevented those diseases which we now know enough to prevent, the average man should live to be one hundred years old.

Prof. Huxley says that that time is coming,—the time is coming when a friend meeting another in the street will as soon ask are you honest as are you well,—when a man will be as ashamed to be told that he looks sick as to be told that he looks like a thief.

It is to bring about such a time that such conventions as this are held, and it is to help bring about this time that I urge the continuance of this work by the formation of a local sanitary organization.

REMARKS BY DR. RHODES, OF FRANKLIN MINE.

I think I can safely say that there is one standing before you now, who does not live on the diseases of his patients. I have been practicing medicine over a third of a century and I can say that I never yet lived on the diseases of my patients. In fact, my living has really consisted in my keeping people well. I do not receive pay from them while they are sick. My pay is for keeping them well, and that only. I am from the Lake Superior copper region district. In that district for a great many years we have had this system of paying physicians by the month or year, and a physician's pay does not consist in the number of visits that he can make or the amount of sickness that he can find, but it does consist in his keeping people well.

I may have something more to say before this convention, but this much I will say here: My impression is that these communicable diseases will not cease to exist until the people rise up and arrive at this same conclusion, to compensate their physicians when they are well, and not pay them when they are sick. Then I believe that the natural disposition will be to find out the cause of the disease, and prevent it.

REMARKS BY DR. MASON W. GRAY.

With reference to the remarks of Dr. Rhodes, I would like to say that the object I had in taking steps to secure this sanitary convention was to spread the knowledge concerning the prevention of disease, which the doctors are willing that the people should have.

I have been connected with the local board of health here for three or four years, and I know that the board of health is willing to meet people more than half way in preventing diseases that are preventable. If the people understood the necessity of taking the steps which are pointed out to them, the work of the local board would be a good deal more perfect and a good deal further extended, and I wish that the people generally would manifest more interest in this work. That is why I wish we could have a sanitary convention here for two or three years; it is why I wish the people who would attend here, would get this interest instilled into them.

Fourth Session—Friday, Oct. 18, at 2:30 P. M.

The convention was called to order by the president. The following musical selection was then rendered: Trio on Themes from Norma (piano, violin and clarionet). Bellini. By Miss Lizzie Thorpe Mr. Simonds and Mr. Ellis.

THE CLIMATE OF MICHIGAN, WITH MORE ESPECIAL REFERENCE TO THE RAINFALL AND TEMPERATURE.

BY SERGT. NORMAN B. CONGER, DIRECTOR OF THE MICHIGAN STATE WEATHER SERVICE.

It has been my pleasure to be assigned a subject upon which I have spent some considerable study during the past three or four years. I have computed some few figures with reference to the rainfall and temperature of this State; and it is my intention to call your attention more especially to that one feature of the climate of this State. These charts are computed from records that run from 1876 to 1888, and in using them and compiling them we have used over four thousand reports, or about twelve thousand observations.

In the first place we will take up the temperature. Now, if we draw a line, commencing in Benzie county, southeast through Manistee, Lake, and Newaygo counties, then easterly through Gratiot, north into Bay, then south into Lapeer, and then up along the shore of Lake Huron in Huron, we find a temperature line of twenty degrees. I find here from this section of country down we have a temperature of twenty, increasing, through this section, from twenty to twenty-six degrees, a difference of six degrees in this section. Oakland county is a portion of the warmest part of the State during the month of January. Wayne and Oakland counties have a mean temperature of about twenty-five degrees,—this being the mean temperature for the month. The temperature increases along the western side of the State. We find the temperature higher all along from Berrien county, down in the southwestern part of the State, clear up into Benzie county; the temperature is higher than it is in the eastern portion of the State or the central portion. During the winter months the low temperature line runs down from the center of the State, it being warmer on each side. The mean temperature for the central section outside of this county, is about twenty-one. The highest temperature during the month of January over a series of fifteen to nineteen years from the signal service statistics at Detroit, is sixty-six, and the lowest was fifteen below zero during the same period; that was in 1879. At Port Huron the temperature was sixty-four, in 1876, and the lowest was fifteen degrees below zero, in 1885. This is to show the range of temperature that is possible, the highest possible temperature that we ever had in this time, and the lowest.

Now, taking the rainfall chart for this period, you will notice that the deepest shading indicates the heaviest rainfall. Where there is no shading at all it is less than two inches. The first shading is from two inches to three, which we find in all the counties south of what we call the northern section or the line going across Manistee, Roscommon over to Iosco, where

the average is two inches and a half,—an average rainfall, except, as you will notice, there is a long line of light rainfall which extends through those sections of the State, running northeast, where the amount is about an inch and three-quarters, and this takes in a portion of this county.

Now, in the month of February, except in the six counties of Calhoun, Jackson, Washtenaw, Monroe, Lenawee, Hillsdale, Branch and a portion of Berrien, the average rainfall is two inches and three-quarters. The rainfall during the winter season is always light in the Upper Peninsula, the average less than two inches. Now, in our temperature for February, there is one thing noticeable: in January the temperature line of twenty, is away up in the northern part of the Lower Peninsula; in February this same line is farther down,—has dropped nearly to Muskegon county; this is due to the influence of the lake, which during January has not been sufficiently cool so that it holds the temperature along the west shore higher than it does in the central portion of the State. In this month we find the temperature is more evenly distributed, from Ottawa county, south on the west shore, and from Lapeer county south on the east. The temperature is from twenty-four to twenty-six, while in the upper portion of the State, in the northern part of the Lower Peninsula, the average is from fourteen to seventeen degrees; and in the Upper Peninsula, the average mean temperature for the month was as low as ten degrees. For the range of temperature in the Upper Peninsula during this month, we will take Marquette, where the lowest that we ever had was minus sixteen degrees, in 1884, and the highest for February, was seventy degrees in 1878. In the Lower Peninsula, Grand Haven in February had a maximum temperature of fifty-eight, and in 1880 a minimum temperature of minus twenty-four, or twenty-four degrees below zero; Detroit, sixty-four, in 1884, and twenty degrees below zero in 1875. The cold of that year extended along the east shore of the State. For this month the range of temperature between the lowest mean temperature of ten in the Upper Peninsula, and an increase gradually as we come south to twenty-six degrees in Wayne county, amounts to sixteen degrees in a State of three hundred and some odd miles.

In March, the peculiarities are noticeable; instead of the temperature lines being so marked in their depression through the central portion of the State, they are straighter across, the temperature being evenly distributed across the entire portion of the State. We find the lines running parallel, almost all the way up until we get into the northern portion of the Lower Peninsula. There we find a peculiarity of temperature, ranging from three to eight degrees north or south of it. The temperature of Oakland county during March is thirty-two degrees, or the average temperature is about freezing, while the county of St. Clair which is north of us, has a temperature of twenty-eight, four degrees lower than we have in Oakland county; and in Macomb, which is adjoining, they have a temperature of twenty-nine, three degrees less. South of us, the temperature ranges almost the same as it does in this county,—the temperature being warmer on the west side of the State, continues through the winter months, the winds blowing up the lake, keeping the temperature higher on the west side of the lake than it is on the east side, on account of the prevailing southwest winds during this portion of the year. The rainfall for March is very evenly distributed over the Lower Peninsula; the average being about two inches and a half over the entire State, except the

Upper Peninsula, which has an average of about an inch and a quarter, and the average is almost the same on the west side of the State as it is on the east. There are no marked peculiarities in the rainfall of March. I might also say that of the rainfall of April.

The April normal decreases slightly from two inches and three-quarters at the southern portion, to one inch and a quarter in the Upper Peninsula. In the normal temperature for April this temperature line of forty degrees, which is a little below the mean for the month, will be found in the northern part of the northern section which runs from Mason county northeast, then southeast, into Gratiot county, and then with a northerly curve down through St. Clair county. Oakland county has an average temperature of forty-five degrees, an increase of thirteen degrees over the month of March. We still find that the high temperature will be found in the southwestern part of the State along the west shore. The range of temperature for April in the Upper Peninsula, ranges from eighty-two in 1887, to three above zero, in 1875. At Detroit, the temperature was eighty-two in 1888, and eight, in 1875. The ranges for Port Huron and Grand Haven on different sides of the State are about the same.

In May our temperature lines, on account of the increased heat of the sun, instead of being curved downward, by the cold of the north, are inclined the other way, and very prominently. The temperature line of fifty-three at Port Huron, mean temperature for May, will be found running through St. Clair, Lapeer, Saginaw, Midland, Gladwin, Oscoda, into Otsego county, up into the northern portion of the State. It then runs south and west into Muskegon county; so that the central portion of the State is the warmer. The high temperature still continues on the west side of the State. The temperature of fifty-six to fifty-eight, which includes the county of Oakland, takes in the entire number of the first four tiers of counties south. The highest temperature in May in the Upper Peninsula, at Marquette, is ninety-two degrees in 1879 and the lowest is twenty-two degrees in 1888. At Detroit, the highest temperature was ninety degrees in 1881, and the lowest was twenty-nine, in 1875. The ranges on the east side of the State, at Port Huron, and on the west side at Grand Haven are practically the same. During the month of May our heavy rainfalls begin. The rainfall will be found the heaviest in the counties of Berrien, Cass, Kalamazoo, Branch, Hillsdale and St. Joseph, and then there is a gradual decrease toward the northern peninsula.

In June, you notice heavy rainfall,—the shade of four inches,—is just commencing to show in the southwestern part of the State. In June, the rainiest month of the year, this rainfall of from four to five inches has worked up in the central portion of the State, and also the rainfall in the Upper Peninsula becomes the heaviest,—four inches and a quarter. The rainfall in the Upper Peninsula during April, May, and June increases from an average of three inches and a quarter to over four inches; in the remaining portion of the State the average rainfall is about three inches and three-quarters. The average for Oakland county is about three inches and ninety-hundreths,—nearly four inches.

In July, our rainfall, you will notice is the heaviest in the Upper Peninsula and then shades down on the west half of the State down to the first three tiers of counties on the south. East of that we have a lighter range, except at Alpena, the average there being over three inches. Now, the temperature

for July, which is our warmest month, ranges from seventy-three degrees in the southern tier of counties, to sixty-four degrees in the Upper Peninsula. It will be noticed that the temperature lines, which were so marked in their upward tendency during May and June, are straightening out more, and getting more parallel. The lines are not so very marked; the temperature is more evenly distributed over the south, and there is a gradual decrease in temperature from the southern portion of the State to the extreme northern portion. The average temperature for Oakland county for July is seventy degrees. That is about four or five degrees above what we would term a happy medium.

As far as the temperature charts are concerned, I will take you no further with them, because they bring us from the coldest month in the year to the warmest; that is, as far as the service has gone in computing the temperature charts.

As to the rainfall peculiarities for August, we find the heaviest rainfall in the Upper Peninsula, and an average of almost three inches and a quarter over almost the entire State. The southern and extreme southern portion has an average of two inches and three-quarters.

In September, we find an extremely heavy rainfall in the Upper Peninsula. This is also a rainy month, practically over the entire State,—the average being about three inches and a half, the heavy rains being in the northern part of the Lower Peninsula, the extreme northeast, with a little patch along the western coast in Ottawa and Allegan counties. The average for Oakland is about three-quarters of an inch less than the average for the section.

In October the heavy rainfall will be found in the northern section, an average of four inches and a quarter. In the remaining portion of the State, except Berrien county, which has an average of about four inches and three-quarters, and St. Clair and Lapeer counties, which have an average of two and three-quarters inches, the rainfall for the State is three and three-quarters.

In November, we find the peculiarity of the heaviest rainfall along the southern tier of counties; and the northwestern portion of the Lower Peninsula, it extends in as far as Clare county.

The average for December is almost the same as for January, two inches and a half.

Now, coming to our annual rainfall, the average for the entire year in this State, we naturally would conclude that the heaviest rainfall would be on the west half of the State. This is found to be the case; the line almost divides it exactly in the southern and central portions, while it moves over to Lake Huron shore, after we get into Alpena county the shades are again lighter as we go west in the Upper Peninsula. We find the heaviest annual rainfall in Michigan to be in Berrien county (43.44 inches), and the lowest in Marquette county (31.63 inches), a difference of about twelve inches between the highest and lowest rainfall in the State.

The question now naturally arises, with this information before us, to what use shall it be put? In the way of health, the question is quickly answered, as a reference to the reports of the State Board of Health shows graphically the use of such data which are now being compiled for the use of the people of this State. The relations of certain diseases to the climatic conditions are strongly marked, and it lies in the scope of these data to

point out to you the conditions most favorable in the State to the different diseases, and for you to take advantage of the information that is thus laid before you.

If we should desire to go to a place where we could get warm days and cool nights, we would naturally go to the central part of the northern part of the Lower Peninsula, and again if you should desire the more softening influences of the lakes, either the west or east side in this same portion will give you that which you seek.

The average winter temperature of this State is 24°, the spring, 43°, summer 68° and the autumn, 49, and the higher temperature during the autumn and winter will be found on the west half of the State.

The average precipitation for the winter season is, 2.53 inches, for the spring, 2.81, for summer, 3.47 inches, and for autumn, 3.15 inches, and an annual amount of 35.85 inches. The majority of this amount falls on the west half, and extends to the east side in the northern section.

Berrien county is the county that receives the largest amount of rainfall during the year, and the county of Marquette receives the least, there being a difference of nearly 12 inches between the maximum, 43.44 inches, and the least, 31.63 inches. The fact of the increased rainfall for the west half of the State is caused by the temperature condition of Lake Michigan, the moisture that is taken from this lake and the prevailing winds of the State for a majority of the year. The winds prevail from the southwest and carry with them the moisture ladened air which deposits it on the west side of the State and when it arrives on the east side across the State the moisture is about all gone, and consequenely the rainfall for the east half is less than that of the west. It will be noticed that the amount of rainfall gradually increases on the west side towards the north, until in June, and again in September we find that the largest amount of rainfall is found in the Upper Peninsula, and then works back again across the straits, and it will be found in the northern section, and by the end of the year the rainfall has become evenly distributed over the State.

In looking back over the records of the past three years it is found that the decrease in rainfall during the summer months has been gradual, and that taking the months of July, August and September, this has been the dryest time we have on the records, the average for these three months being but a trifle over one inch and three-quarters, while the normal for the same period is three inches and one-quarter. The dryest summer, June, July and August, occurred in 1887, when the average amount of rainfall was but two inches and three-quarters (2.66).

The summer of the greatest rainfall was in 1882, the average amount for that period was 4.76 inches, or considerably over an inch above the normal rainfall for that period.

The records show that the coldest winter occurred in 1885, the mean temperature being 15° or about six degrees below the normal temperature.

The warmest summer season occurred in 1876, when the temperature was 4° above the normal.

It is interesting to note that extreme drouths, or an excess in temperature or a deficiency in the temperature, never occur in all sections of the State in the same month. It will be noticed that if one section of the State is suffering with drouth, other sections receive plenteous showers that tend at least to moisten the air if it produces no rain in the dry sections.

The rainfall of the State is one of the most interesting subjects to study for the many varied phases each month in the different portions of the State, or even in the same locality. The rainfall charts which are now published monthly, are among the best educators in the matter that can be obtained. It is also curious to note that while the average number of rainy days recorded in the State may not exceed eight, yet, there will be rain recorded in the different sections of the State on nearly every day of the month.

Let us take the month of September: The average number of rainy days recorded in the State was eight, and there was rain recorded on every day but five, and this at a time when this county (Oakland) was suffering severely from the long continued drouth that has been so severe on the corn and potato crops in this locality. When a rain occurs at my station, the people are prone to believe that the rain is falling in all portions of the State. This a popular error, and one that is fast losing ground, and the published reports of today, in showing the exact amount recorded in nearly every county of the State, are probably doing more towards it than most any other agent.

The climate of this State brings, annually, thousands of people in search of the pleasant, sunshiny days and the cool nights, which go so much in the way of building up broken health and constitutions.

If the health conditions are such that need a moist climate, and not a temperature with great daily ranges, the Lake Michigan shore will be found to meet the requirements of this class, while for a dryer climate, the eastern portion of the central section will be more to your liking. Where high day temperatures and low night ones are sought, they will be found in the central part of the northern section, or in the Upper Peninsula, but the climate of the Upper Peninsula is controlled to a greater or less degree by the influences of the two lakes that wash its shores, and the day temperatures will not be found quite so high, while the cool nights predominate in the summer season.

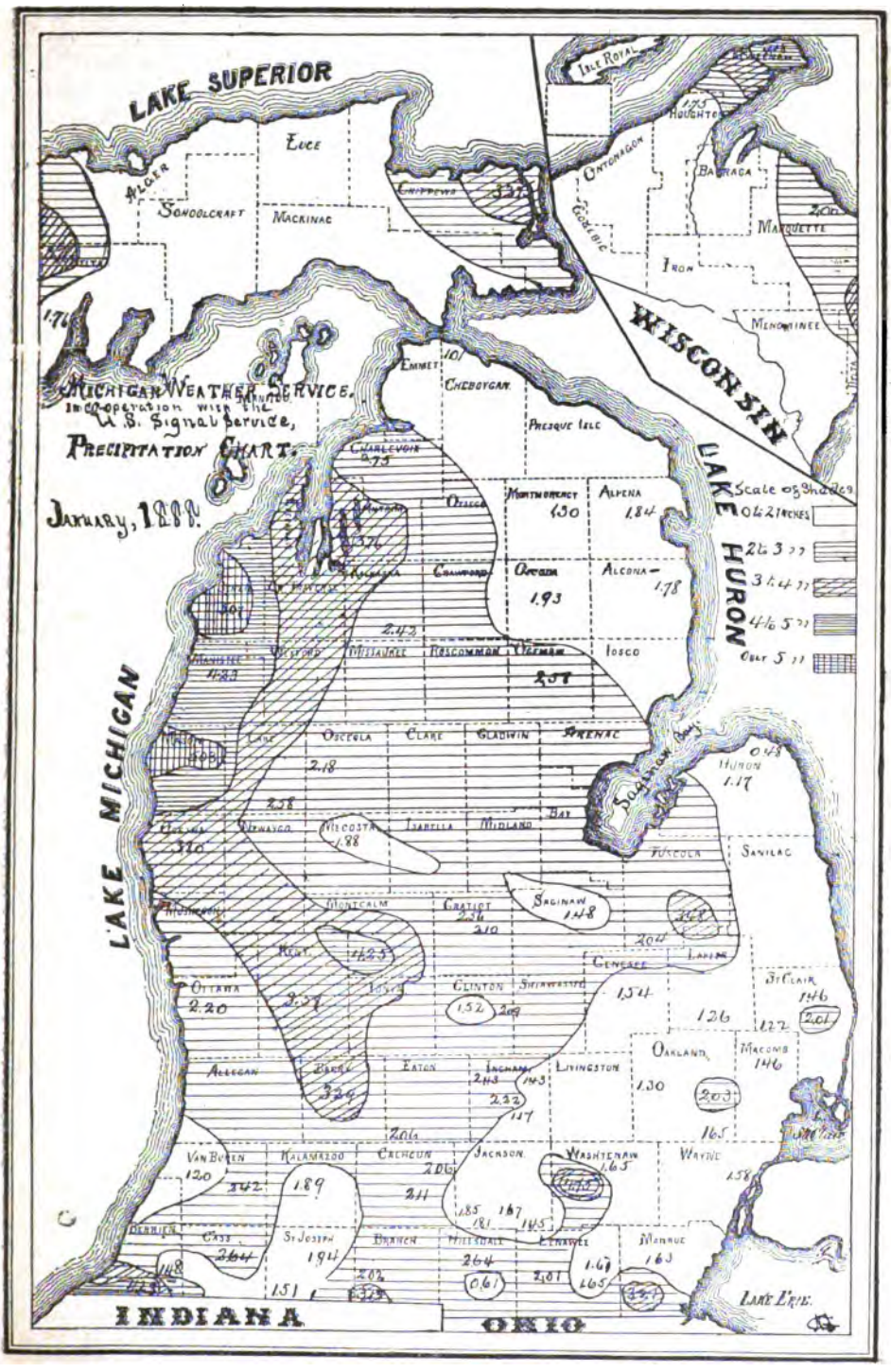
It was not my intention in this paper to compare any sickness with these climatic conditions, as it is simply my work to lay down to you the climatic conditions and leave it to you to use them as it may best suit your inclination. The graphic charts of the Secretary of the State Board of Health, Dr. Baker, are the best proofs of the use to which these data can be put, and the relations that sickness bears to the daily climatic conditions in which we live will be the natural outcome of such a study.

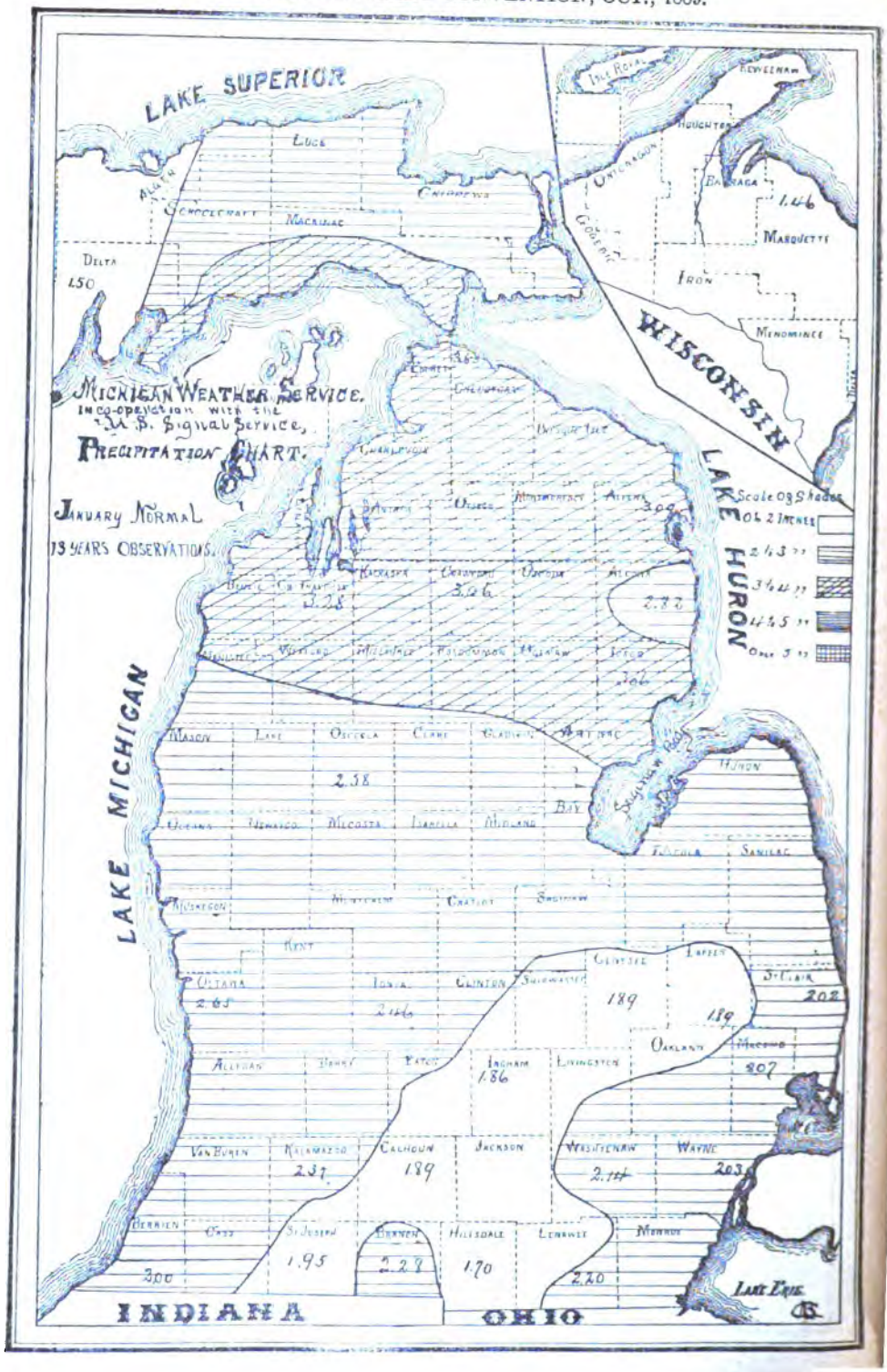
The values which have been given in this paper are for the State at large, but the changes from the Upper Peninsula to the southern section, are such that they coincide very nearly with the temperature of the central section, in which the county of Oakland is situated. Reports or observations have not been carried on in this county a sufficient length of time to make it profitable to compute any averages for this locality, and therefore it might be well to use the data of the station at Detroit for reference.

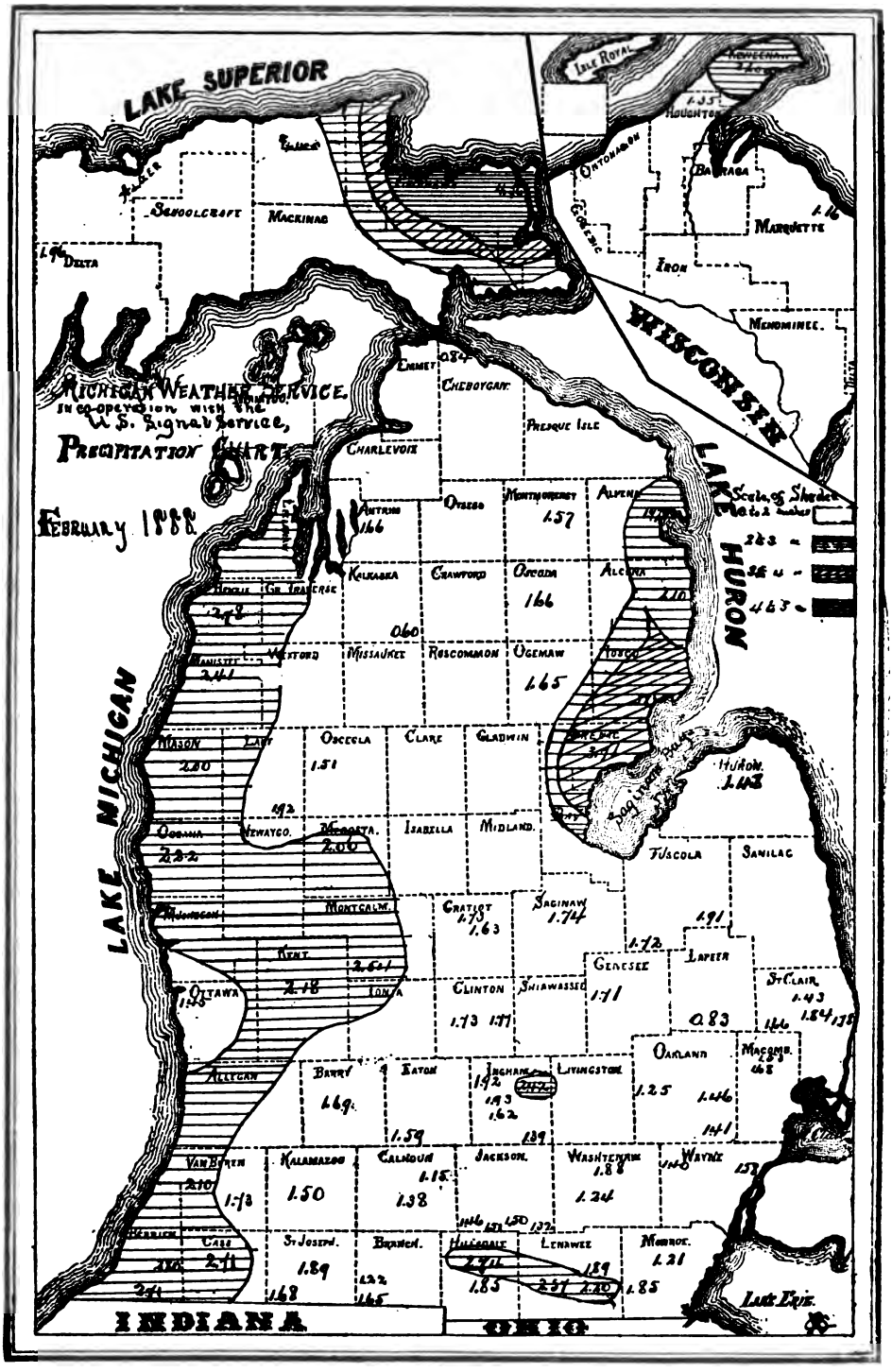
In the record of the number of clear, fair or cloudy days as taken from the reports of the signal service the following stations are selected to show the average conditions as they exist in the State: Alpena has an average of 85 clear days, 144 fair days, and 136 cloudy days; Detroit, 87 clear, 148 fair, and 130 cloudy days; Escanaba, 81 clear, 155 fair, and 130 cloudy; Grand Haven, 92 clear days, 136 fair days, and 137 cloudy days; Port

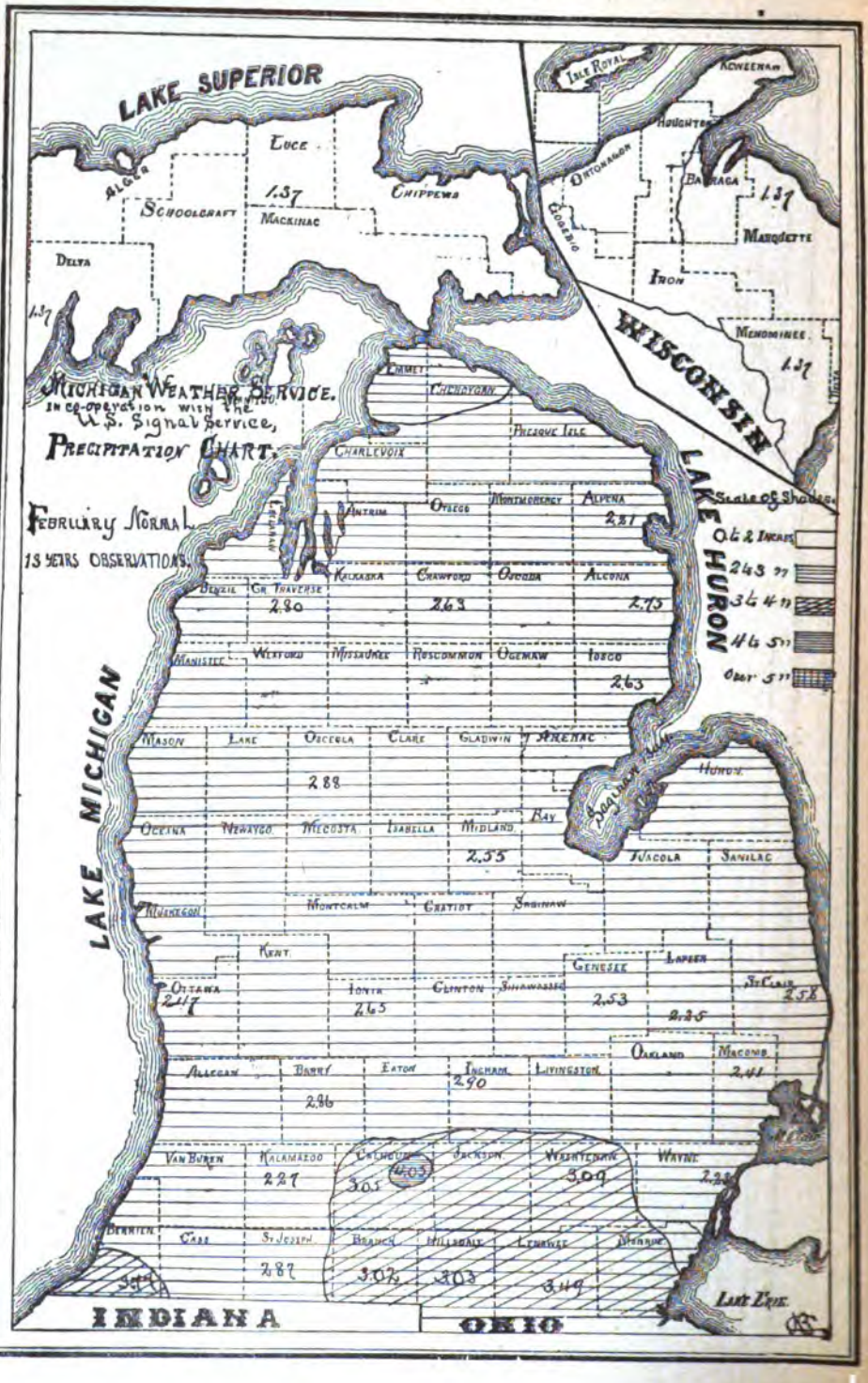
Huron, 76 clear days, 157 fair, and 132 cloudy; Marquette, 82 clear, 146 fair, and 137 cloudy days; Chicago, 108 clear, 149 fair, and 109 cloudy days. The average percentage of cloudiness is less in the south half of the State than in the north, which would in consequence give more sunshine to the south half than to the north.

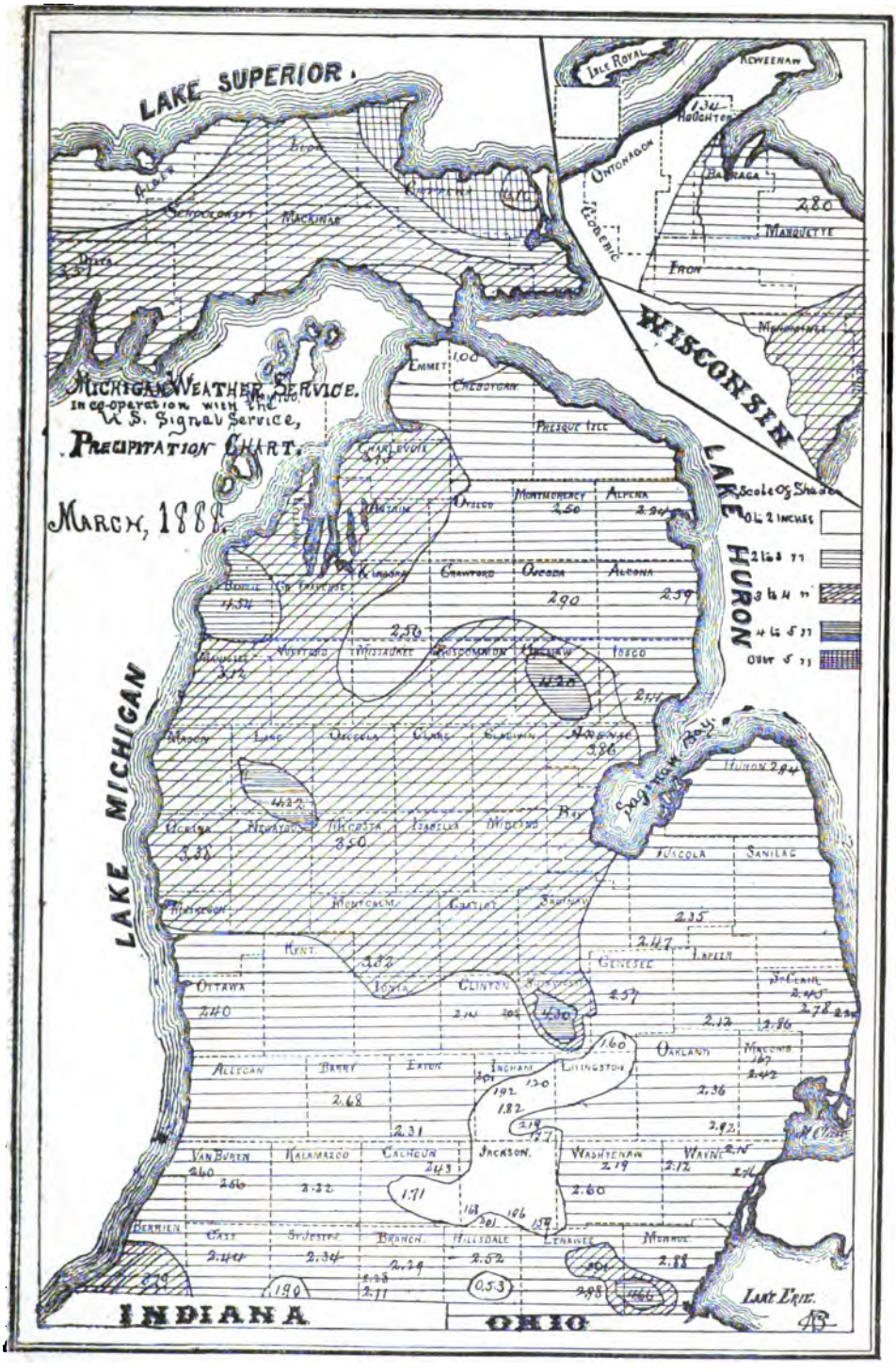
This combination of sunshiny days, a temperature that in the summer months is near that happy medium, and the nights that are cool go far towards giving us a climate that cannot be excelled, for the reason that in the wide expanse of this State from the north to the south, you may almost choose the climate that is most agreeable to you.

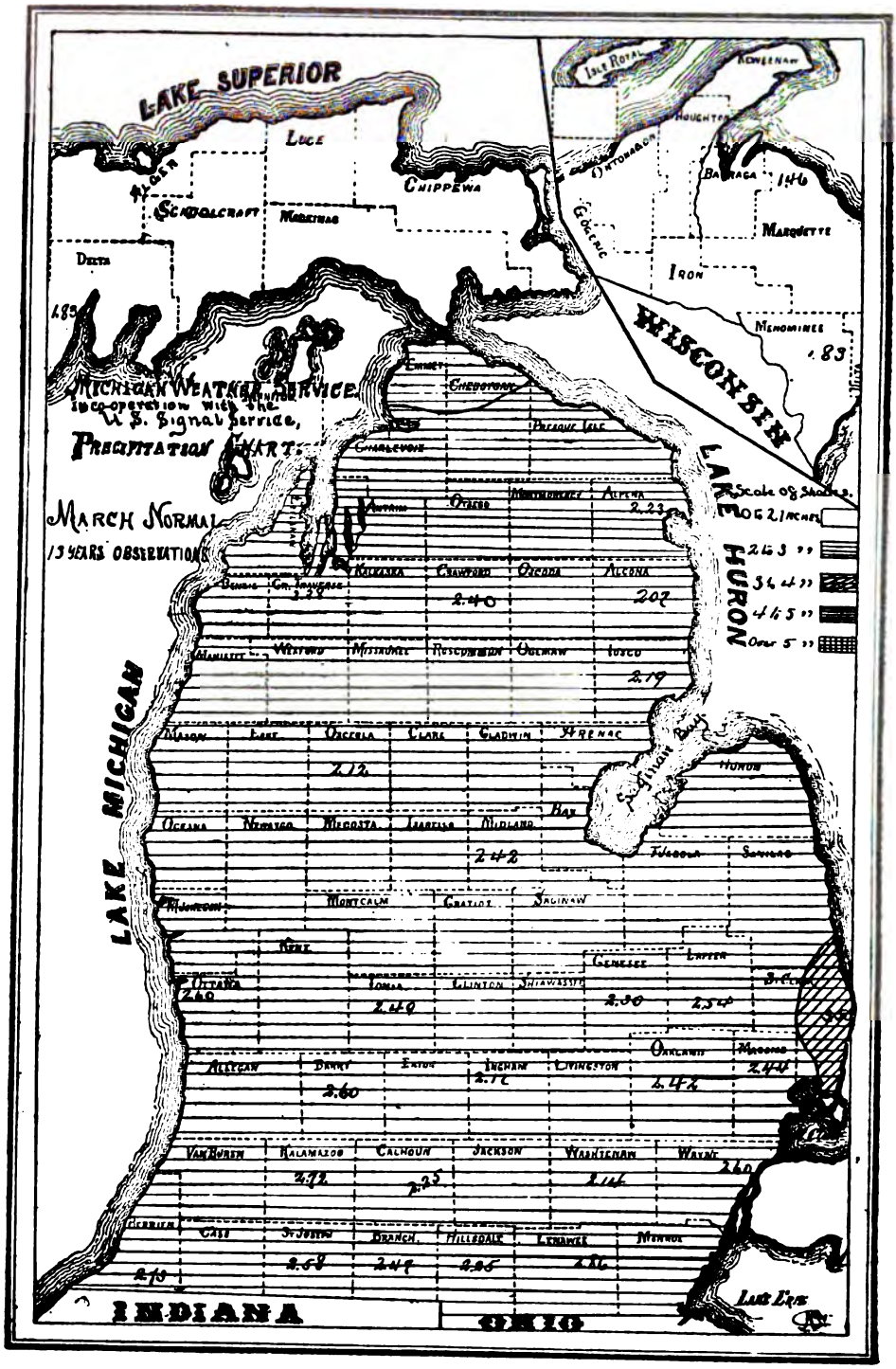

LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
INDIANA
OHIO
MICHIGAN WEATHER SERVICE.
In Co-operation with the U.S. Signal Service,
PRECIPITATION CHART.
JANUARY, 1888.
Scale of Shades
0 to 2 Inches
2 to 3 "
3 to 4 "
4 to 5 "
Over 5 "
Isle Royal
Houghton
Ontonagon
Baraga
Marquette
Gogebic
Iron
Menominee
Alger
Schoolcraft
Mackinac
Chippewa
Luce
Emmet
Cheboygan
Presque Isle
Charlevoix
Otsego
Montmorency
Alpena
Crawford
Oscoda
Alcona
Roscommon
Ogemaw
Iosco
Missaukee
Wexford
Osceola
Clare
Gladwin
Arenac
Huron
Bay
Midland
Isabella
Gratiot
Saginaw
Tuscola
Sanilac
Montcalm
Ionia
Clinton
Shiawassee
Genesee
Lapeer
St. Clair
Ottawa
Kent
Allegan
Barry
Eaton
Ingham
Livingston
Oakland
Macomb
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Wayne
Berrien
Cass
St. Joseph
Branch
Hillsdale
Lenawee
Monroe

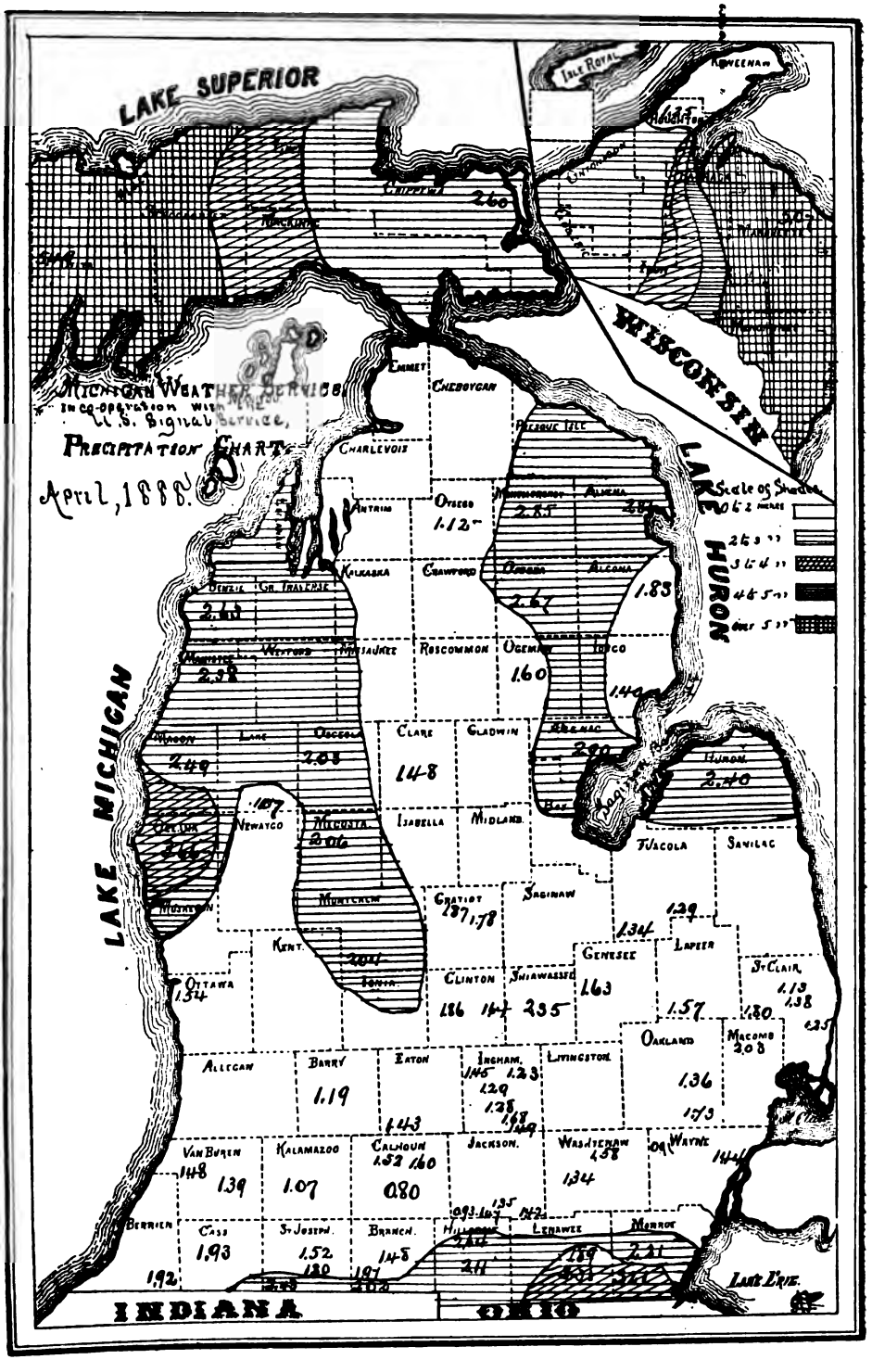

LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
LAKE HURON
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U.S. SIGNAL SERVICE.
PRECIPITATION CHART.
JANUARY NORMAL
13 YEARS OBSERVATIONS.
Scale of Shades
0 & 2 INCHES
2 1/2 3 "
3 1/2 4 "
4 1/2 5 "
OVER 5 "
Isle Royale
Keweenaw
Houghton
Ontonagon
Baraga
1.46
Marquette
Iron
Menominee
Delta
1.50
Schoolcraft
Alger
Luce
Chippewa
Mackinac
Emmet
Cheboygan
Presque Isle
Charlevoix
Antrim
Otsego
Montmorency
Alpena
3.09
Kalkaska
Crawford
Oscoda
Alcona
3.28
3.26
2.82
Grand Traverse
Leelanau
Benzie
Manistee
Wexford
Missaukee
Roscommon
Ogemaw
Iosco
2.06
Mason
Lake
Osceola
Clare
Gladwin
Arenac
Huron
2.58
Bay
Saginaw
Oceana
Newaygo
Mecosta
Isabella
Midland
Tuscola
Sanilac
Muskegon
Montcalm
Gratiot
Shiawassee
Kent
Ottawa
2.65
Ionia
2.46
Clinton
Genesee
Lapeer
St. Clair
2.02
189
189
Oakland
Macomb
2.07
Allegan
Barry
Eaton
Ingham
1.86
Livingston
Van Buren
Kalamazoo
2.37
Calhoun
189
Jackson
Washtenaw
2.14
Wayne
2.03
Berrien
Cass
St. Joseph
1.95
Branch
2.29
Hillsdale
1.70
Lenawee
2.20
Monroe
Lake Erie
3.00
INDIANA
OHIO

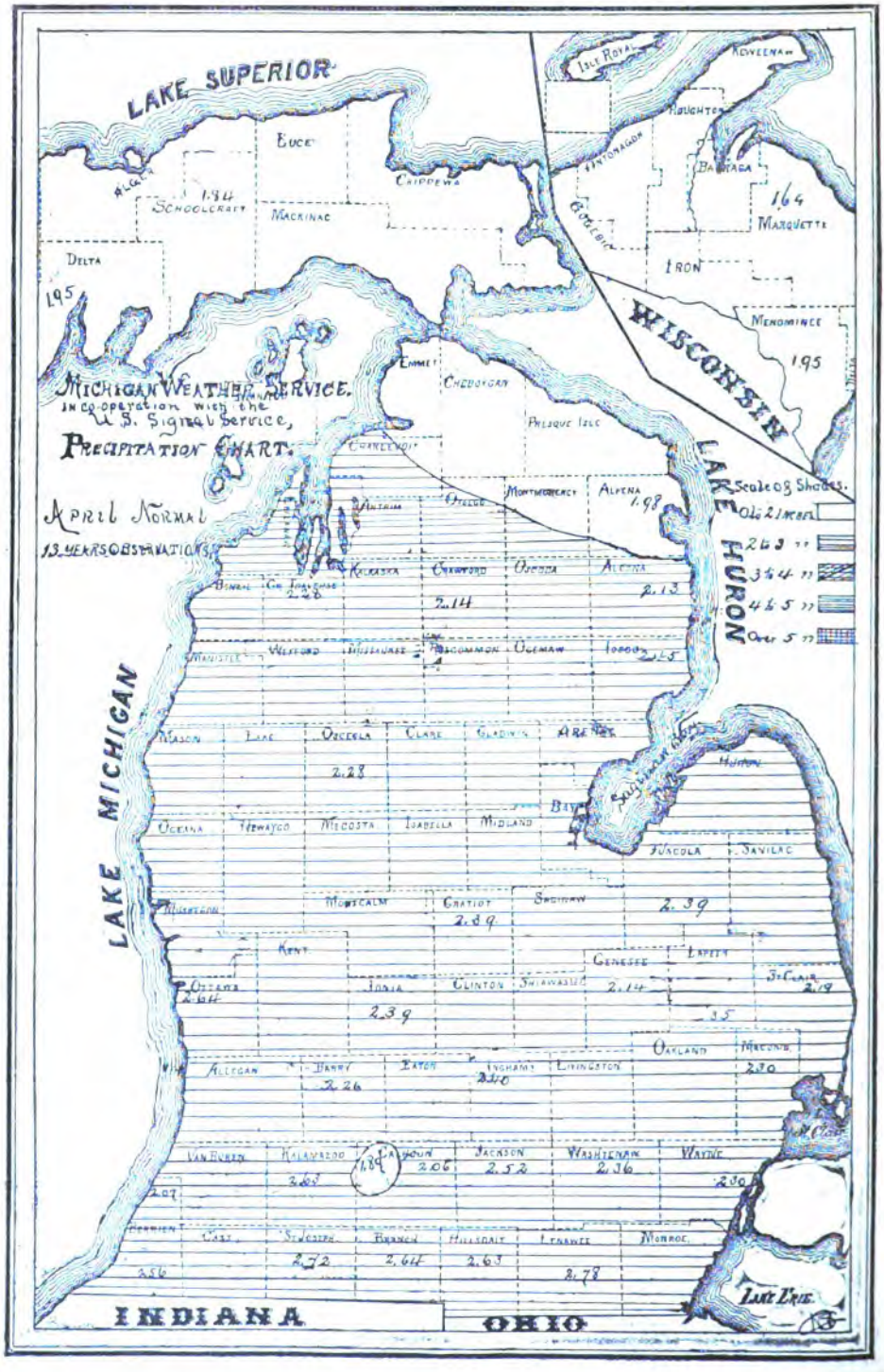

LAKE SUPERIOR
Isle Royal
Houghton
Ontonagon
Baraga
Marquette
Schoolcraft
Mackinac
Delta
Iron
Menominee
WISCONSIN
Emmet
Cheboygan
Presque Isle
Charlevoix
LAKE HURON
LAKE MICHIGAN
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U.S. SIGNAL SERVICE,
PRECIPITATION CHART.
FEBRUARY 1888.
Scale of Shades
Antrim
Otsego
Montmorency
Alpena
Kalkaska
Crawford
Oscoda
Alcona
Grand Traverse
Manistee
Wexford
Missaukee
Roscommon
Ogemaw
Iosco
Mason
Lake
Osceola
Clare
Gladwin
Arenac
Huron
Oceana
Newaygo
Mecosta
Isabella
Midland
Tuscola
Sanilac
Muskegon
Montcalm
Gratiot
Saginaw
Kent
Ottawa
Ionia
Clinton
Shiawassee
Genesee
Lapeer
St. Clair
Allegan
Barry
Eaton
Ingham
Livingston
Oakland
Macomb
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Wayne
Berrien
Cass
St. Joseph
Branch
Hillsdale
Lenawee
Monroe
Lake Erie
INDIANA
OHIO

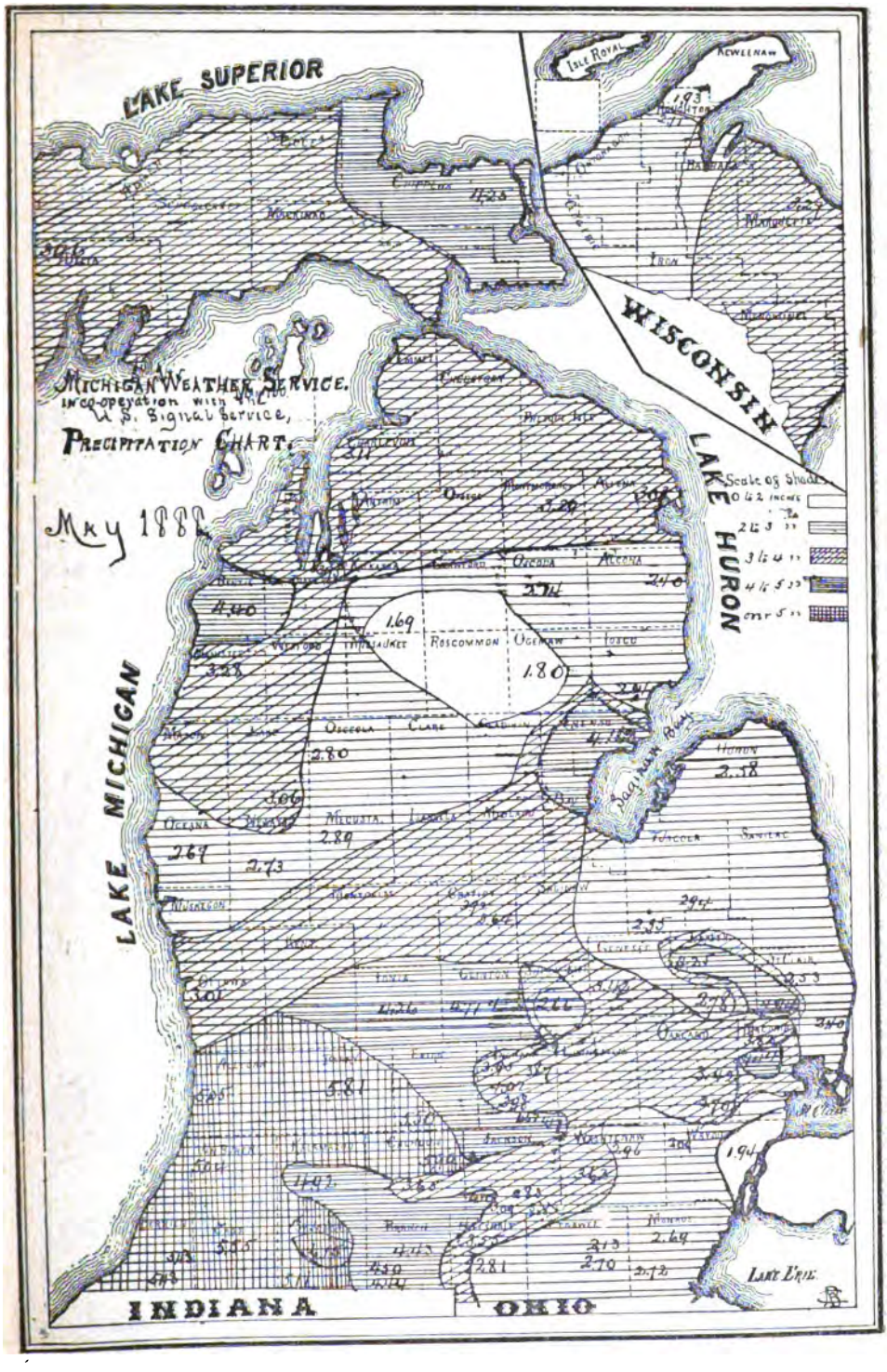

LAKE SUPERIOR
ISLE ROYAL
KEWEENAW
HOUGHTON
ONTONAGON
BARAGA
MARQUETTE
GOGEBIC
IRON
MENOMINEE
WISCONSIN
LUCE
ALGER
SCHOOLCRAFT
MACKINAC
CHIPPEWA
DELTA
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U.S. SIGNAL SERVICE,
PRECIPITATION CHART.
FEBRUARY NORMAL.
13 YEARS OBSERVATIONS.
EMMET
CHEBOYGAN
PRESQUE ISLE
CHARLEVOIX
ANTRIM
OTSEGO
MONTMORENCY
ALPENA
LEELANAU
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
BENZIE
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
LAKE MICHIGAN
LAKE HURON
Scale of Shades.
0 & 2 Inches
2 & 3 "
3 & 4 "
4 & 5 "
Over 5 "
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
HURON
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
TUSCOLA
SANILAC
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
KENT
GENESEE
LAPEER
ST. CLAIR
OTTAWA
IONIA
CLINTON
SHIAWASSEE
OAKLAND
MACOMB
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST. JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
LAKE ERIE
INDIANA
OHIO

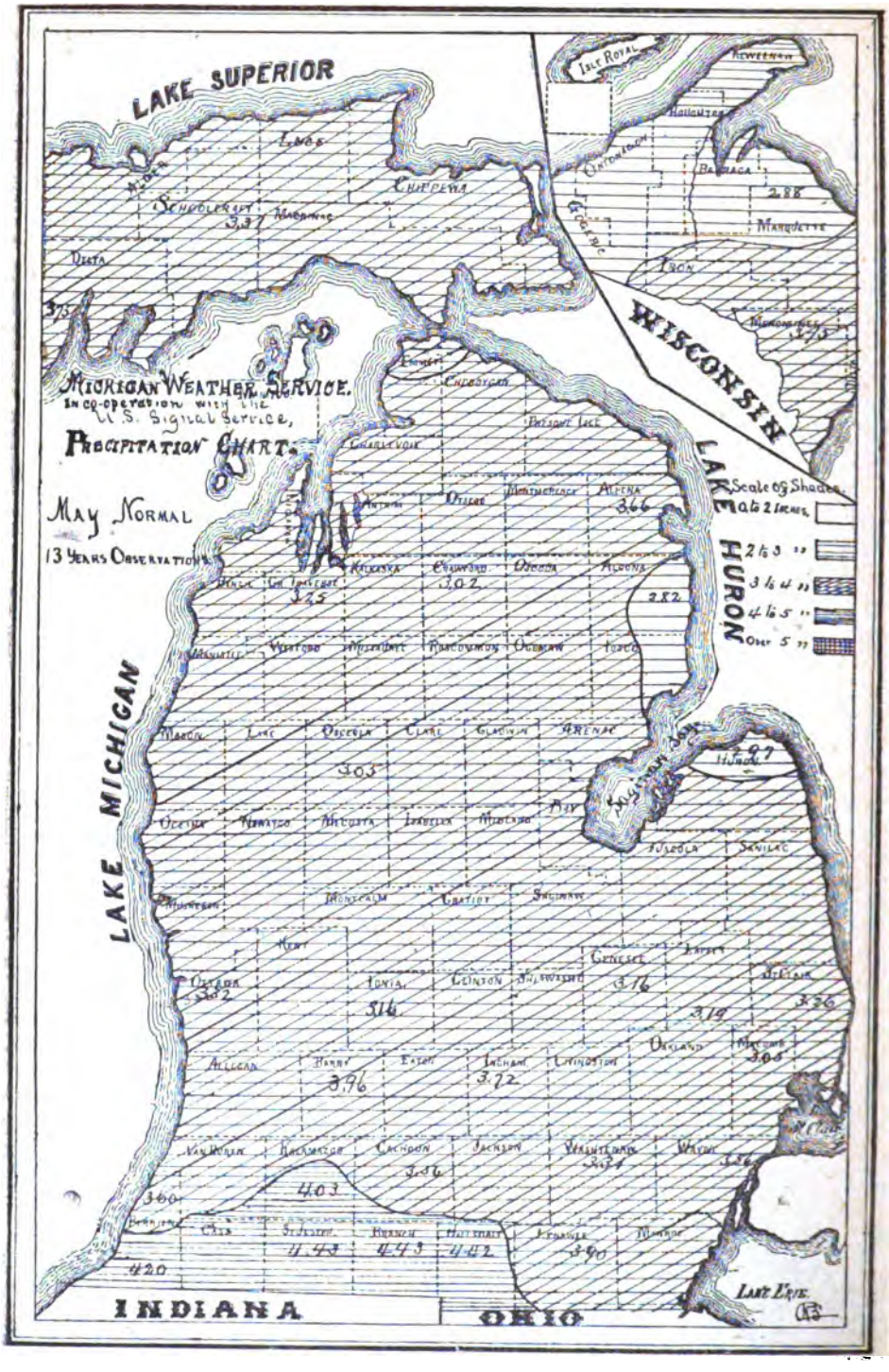

LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
INDIANA
OHIO
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U.S. SIGNAL SERVICE,
PRECIPITATION CHART.
MARCH, 1888.
Scale of Shade
Isle Royal
Keweenaw
Houghton
Ontonagon
Gogebic
Baraga
Marquette
Iron
Menominee
Delta
Schoolcraft
Mackinac
Emmet
Cheboygan
Presque Isle
Charlevoix
Antrim
Otsego
Montmorency
Alpena
Kalkaska
Crawford
Oscoda
Alcona
Roscommon
Ogemaw
Iosco
Missaukee
Wexford
Manistee
Grand Traverse
Benzie
Leelanau
Lake
Osceola
Clare
Gladwin
Arenac
Huron
Bay
Saginaw
Midland
Isabella
Gratiot
Montcalm
Mecosta
Newaygo
Oceana
Mason
Manistee
Lapeer
Genesee
Sanilac
Tuscola
Kent
Ottawa
Ionia
Clinton
Shiawassee
St. Clair
Macomb
Oakland
Allegan
Barry
Eaton
Ingham
Livingston
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Wayne
Berrien
Cass
St. Joseph
Branch
Hillsdale
Lenawee
Monroe

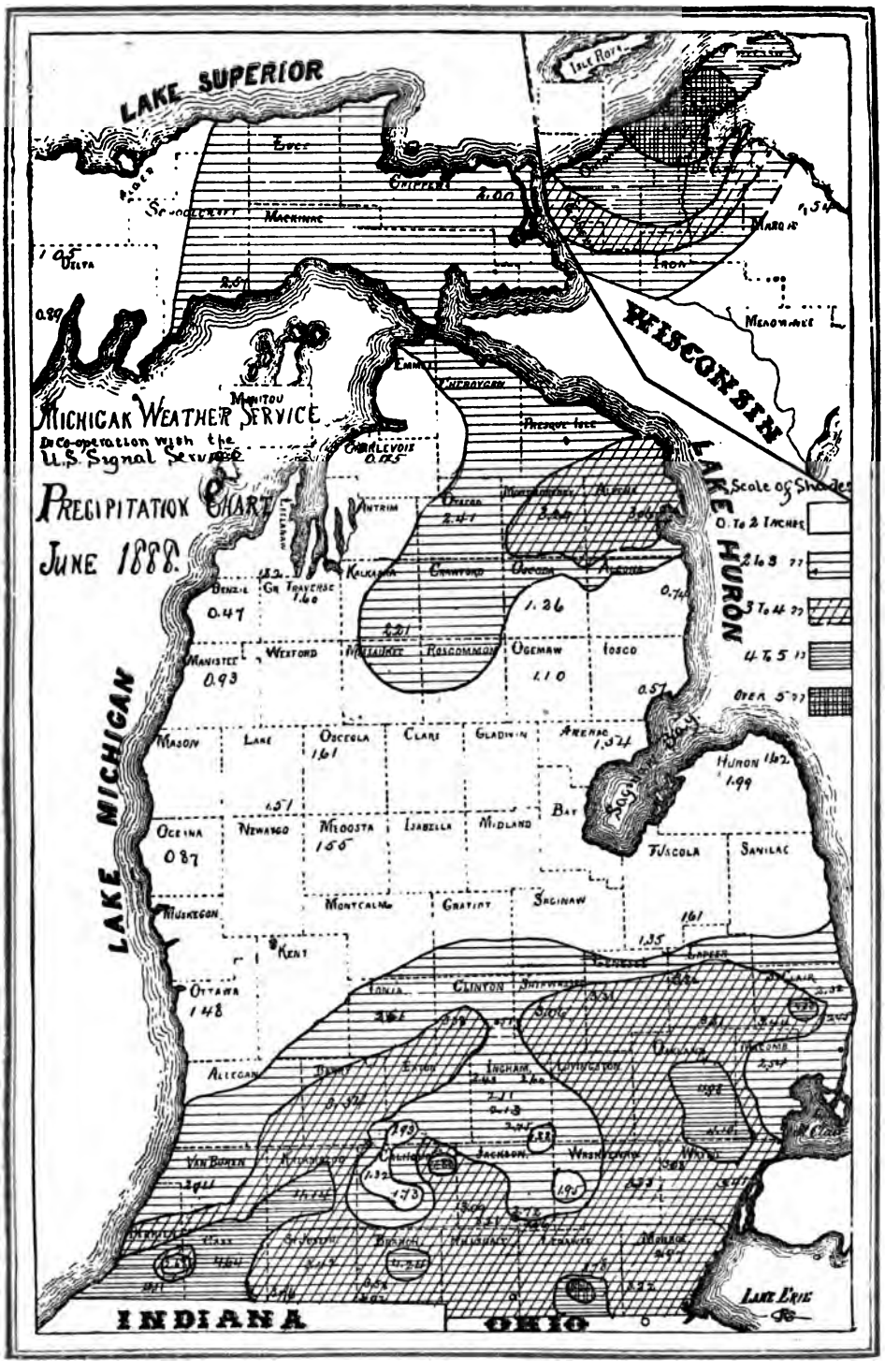

LAKE SUPERIOR
Luce
Chippewa
Schoolcraft
Mackinac
Delta
Houghton
Baraga
Marquette
Iron
Menominee
WISCONSIN
Gogebic
Ontonagon
Keweenaw
Isle Royal
MICHIGAN WEATHER SERVICE
in co-operation with the
U.S. Signal Service,
PRECIPITATION CHART.
MARCH NORMAL
13 YEARS OBSERVATIONS
Scale of Shades.
0 to 2 Inches
2 to 3 "
3 to 4 "
4 to 5 "
Over 5 "
LAKE HURON
LAKE MICHIGAN
Emmet
Cheboygan
Presque Isle
Charlevoix
Otsego
Montmorency
Alpena
2.23
Antrim
Kalkaska
Crawford
Oscoda
Alcona
2.40
2.07
Benzie
Gr. Traverse
3.29
Manistee
Wexford
Missaukee
Roscommon
Ogemaw
Iosco
2.19
Mason
Lake
Osceola
Clare
Gladwin
Arenac
2.12
Saginaw Bay
Huron
Oceana
Newaygo
Mecosta
Isabella
Midland
2.42
Tuscola
Sanilac
Muskegon
Montcalm
Gratiot
Saginaw
Kent
Genesee
Lapeer
Ottawa
2.60
Ionia
2.49
Clinton
Shiawassee
2.30
2.54
Allegan
Barry
2.60
Eaton
Ingham
2.76
Livingston
2.42
Oakland
Macomb
2.44
Van Buren
Kalamazoo
2.72
Calhoun
2.25
Jackson
Washtenaw
2.14
Wayne
2.60
Berrien
Cass
St. Joseph
2.68
Branch
2.47
Hillsdale
2.85
Lenawee
2.86
Monroe
2.70
Lake Erie
INDIANA
OHIO

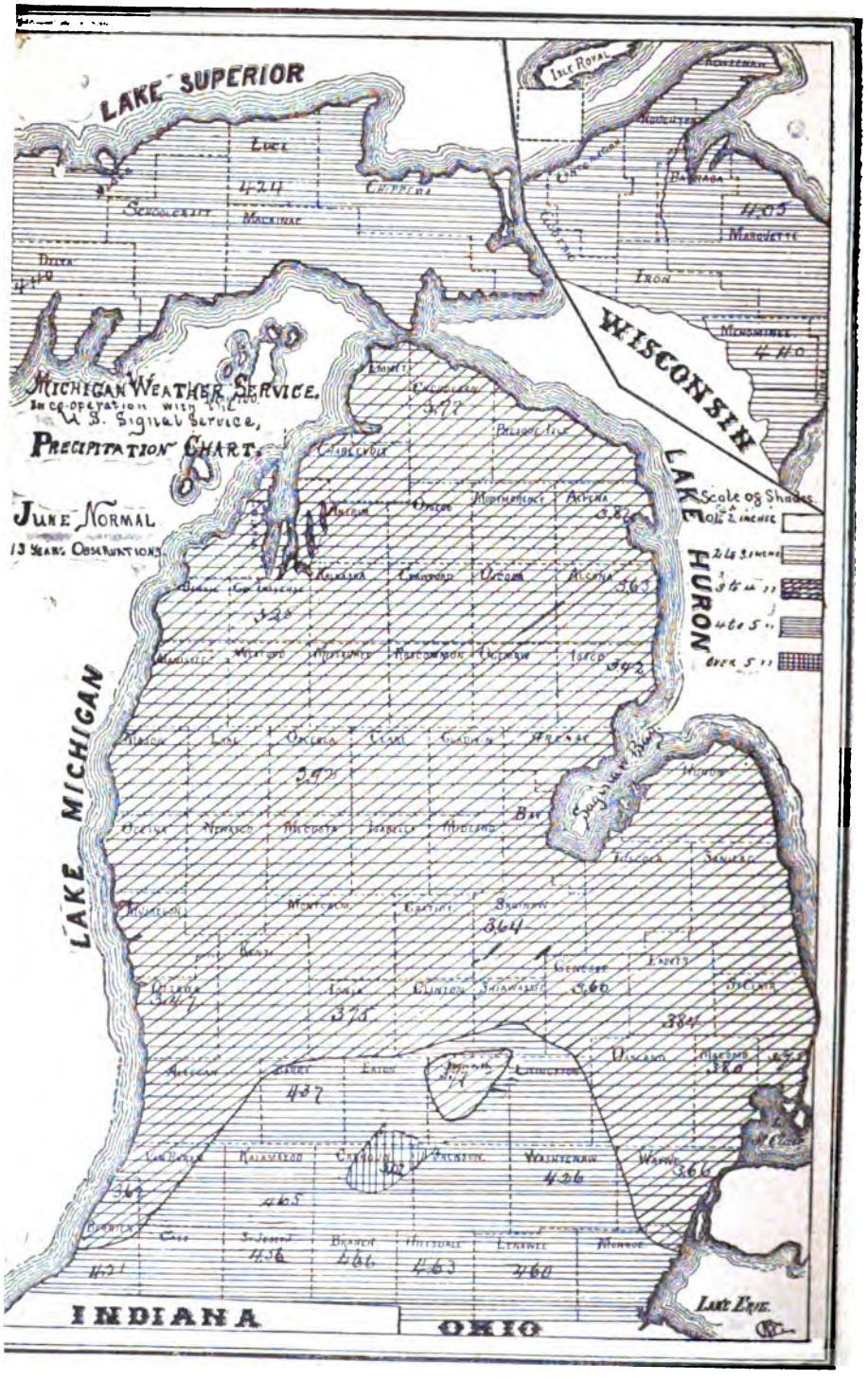

LAKE SUPERIOR
ISLE ROYAL
KEWEENAW
HOUGHTON
ONTONAGON
GOGEBIC
MARQUETTE
MENOMINEE
DELTA
SCHOOLCRAFT
ALGER
CHIPPEWA
260
MACKINAC
WISCONSIN
LAKE HURON
LAKE MICHIGAN
MICHIGAN WEATHER SERVICE
IN CO-OPERATION WITH
U.S. Signal Service,
PRECIPITATION CHART.
April, 1886.
Scale of Shades
0 to 2 inches
2 to 3 " "
3 to 4 " "
4 to 5 " "
over 5 " "
EMMET
CHEBOYGAN
PRESQUE ISLE
CHARLEVOIX
ANTRIM
OTSEGO
1.12
MONTMORENCY
ALPENA
2.85
ALCONA
2.83
KALKASKA
CRAWFORD
OSCODA
2.67
1.83
GR. TRAVERSE
LEELANAU
BENZIE
2.63
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
1.60
IOSCO
1.44
MANISTEE
2.38
MASON
LAKE
OSCEOLA
2.03
CLARE
GLADWIN
1.48
ARENAC
2.80
HURON
2.40
LAKE
BAY
OCEANA
1.87
NEWAYGO
MECOSTA
2.06
ISABELLA
MIDLAND
TUSCOLA
SANILAC
MUSKEGON
MONTCALM
GRATIOT
1.37
1.78
SAGINAW
1.39
1.34
KENT.
2.01
IONIA
GENESEE
LAPEER
1.63
1.57
ST. CLAIR
1.13
1.38
1.80
1.25
OTTAWA
1.34
CLINTON
1.86
1.47
2.35
SHIAWASSEE
OAKLAND
2.08
1.36
1.73
MACOMB
ALLEGAN
BARRY
1.19
EATON
1.43
INGHAM.
1.46
1.23
1.29
1.28
1.49
LIVINGSTON
VAN BUREN
1.48
1.39
KALAMAZOO
1.07
CALHOUN
1.52
1.60
0.80
JACKSON.
WASHTENAW
1.58
1.34
WAYNE
1.41
1.35
1.07
1.42
BERRIEN
1.92
CASS
1.93
ST. JOSEPH.
1.52
1.30
BRANCH.
1.48
1.87
HILLSDALE
LENAWEE
1.89
MONROE
2.31
2.11
LAKE ERIE
INDIANA
OHIO

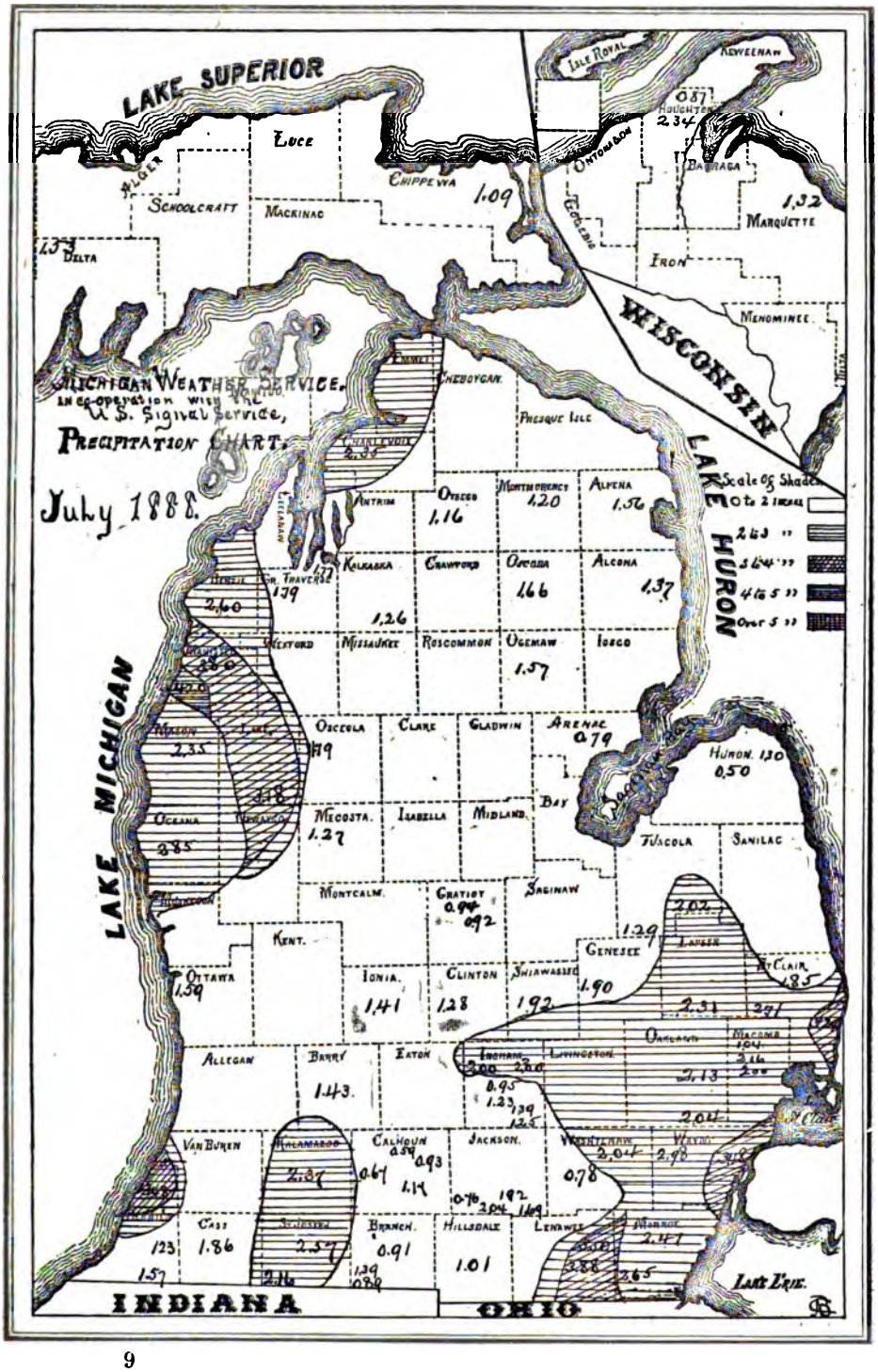

LAKE SUPERIOR
Isle Royal
Keweenaw
Houghton
Baraga
Antonagon
Gogebic
Iron
Menominee
Wisconsin
Marquette
Delta
Schoolcraft
Mackinac
Chippewa
Alger
Luce
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U.S. SIGNAL SERVICE,
PRECIPITATION CHART.
APRIL NORMAL
13 YEARS OBSERVATIONS.
Scale of Shades.
Emmet
Cheboygan
Presque Isle
Otsego
Montmorency
Alpena
Antrim
Kalkaska
Crawford
Oscoda
Alcona
Roscommon
Ogemaw
Iosco
Manistee
Wexford
Missaukee
Lake Michigan
Lake Huron
Mason
Lake
Osceola
Clare
Gladwin
Arenac
Huron
Oceana
Newaygo
Mecosta
Isabella
Midland
Bay
Saginaw
Tuscola
Sanilac
Muskegon
Montcalm
Gratiot
Shiawassee
Kent
Genesee
Lapeer
St. Clair
Ottawa
Ionia
Clinton
Oakland
Macomb
Allegan
Barry
Eaton
Ingham
Livingston
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Wayne
Berrien
Cass
St. Joseph
Branch
Hillsdale
Lenawee
Monroe
Lake Erie
INDIANA
OHIO

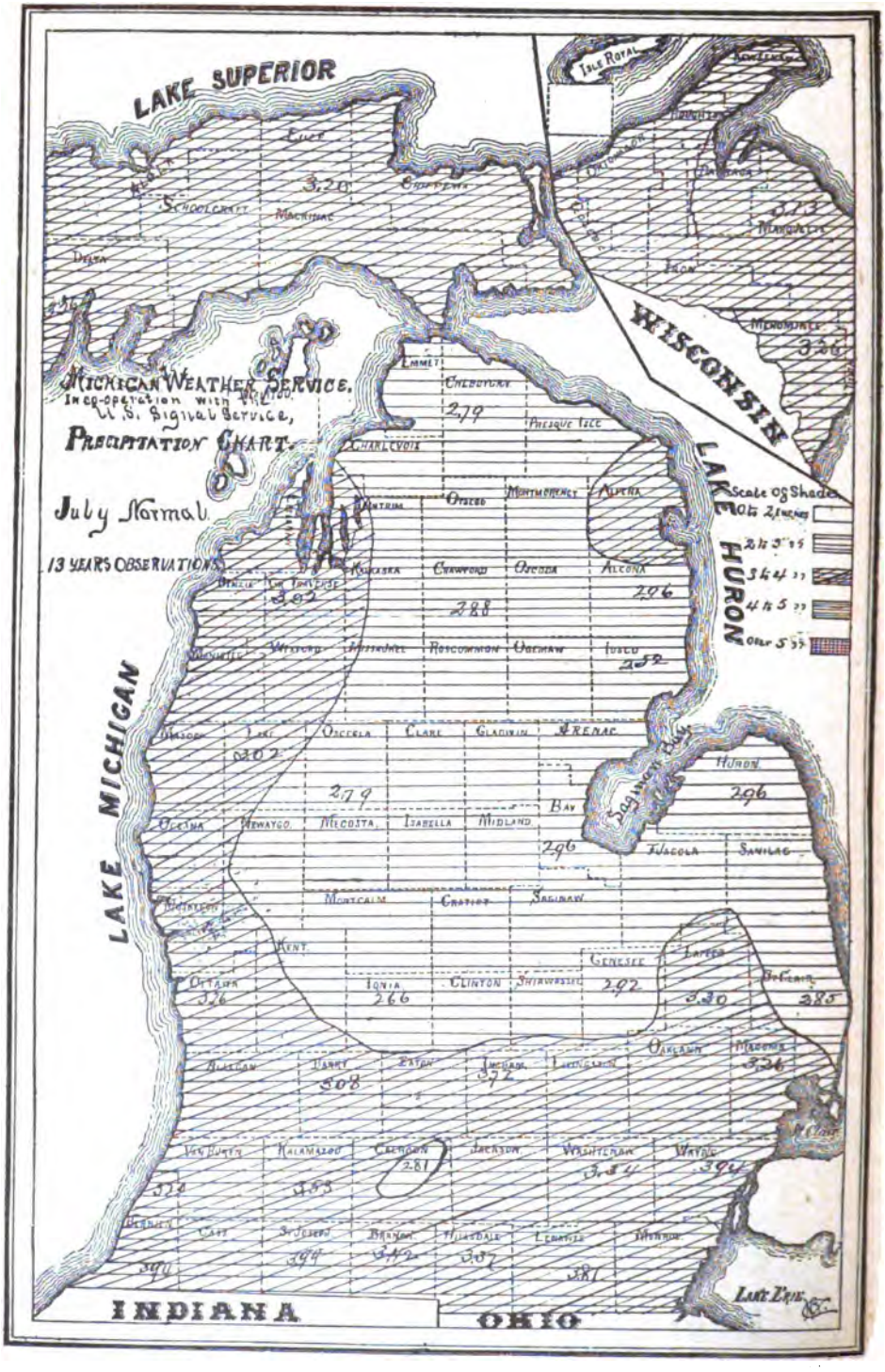

LAKE SUPERIOR
ISLE ROYAL
KEWEENAW
WISCONSIN
LAKE HURON
LAKE MICHIGAN
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U.S. SIGNAL SERVICE,
PRECIPITATION CHART.
MAY 1887.
Scale of Shades.
0 TO 2 INCHES
2 TO 3 "
3 TO 4 "
4 TO 5 "
OVER 5 "
1.69
1.80
2.80
2.89
2.73
5.81
2.64
2.81
2.70
2.72
1.94
2.58
3.20
4.40
2.40
2.95
3.01
2.69
3.06
3.26
3.48
3.07
3.65
3.64
3.44
3.40
3.49
3.96
3.13
3.65
3.64
3.13
3.50
3.14
3.93
3.87
3.98
3.95
3.07
3.98
3.93
3.87
3.98
3.95
3.07
3.98
3.93
3.87
3.98
3.95
3.07
3.98

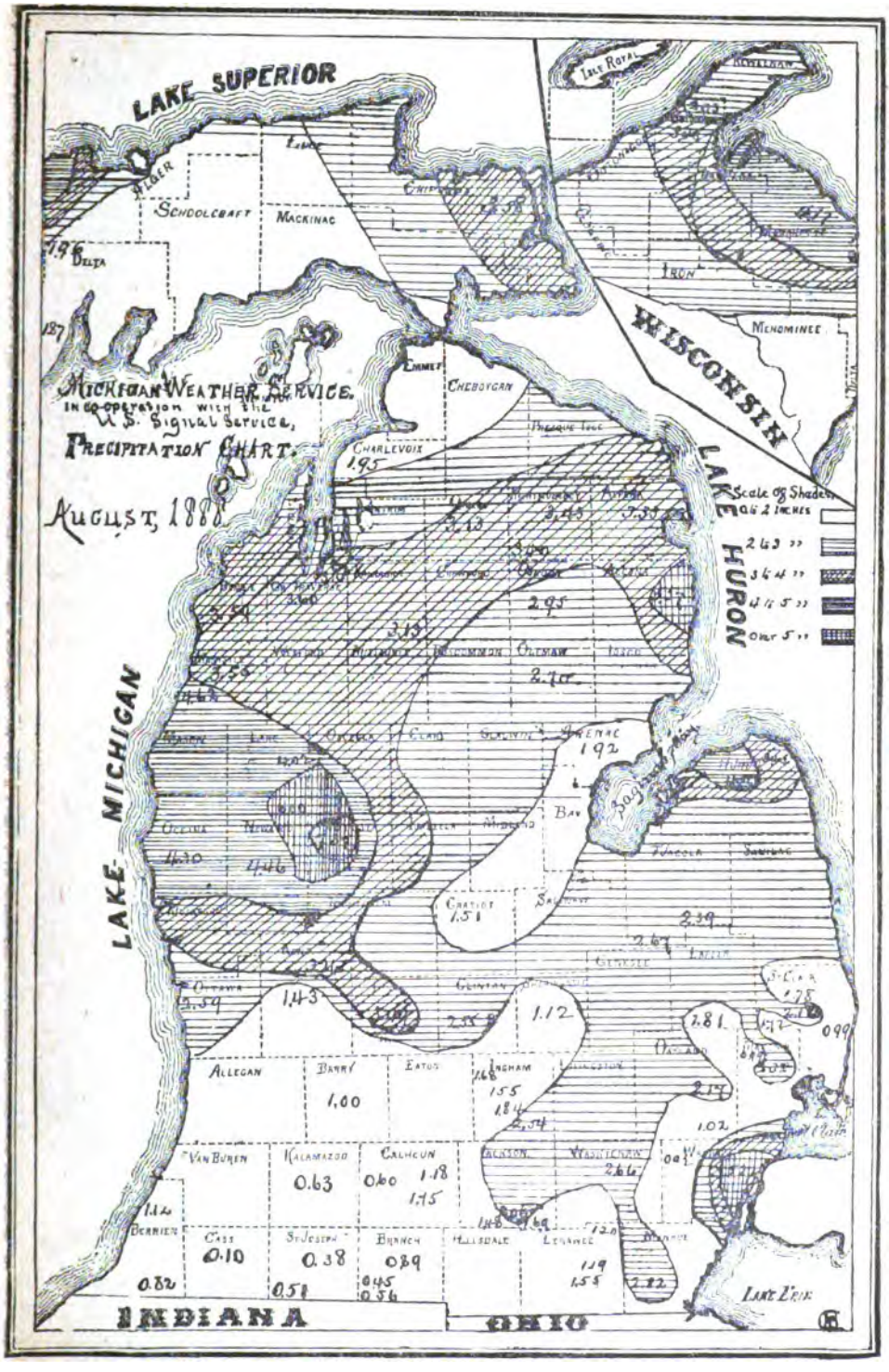

LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
LAKE HURON
INDIANA
OHIO
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U.S. SIGNAL SERVICE,
PRECIPITATION CHART.
MAY NORMAL
13 YEARS OBSERVATIONS
Scale of Shades.
3.37
3.66
2.88
3.25
3.02
2.82
3.03
3.14
3.16
3.19
3.26
3.05
3.96
3.72
3.56
4.03
4.43
4.42
3.90
4.20
3.60

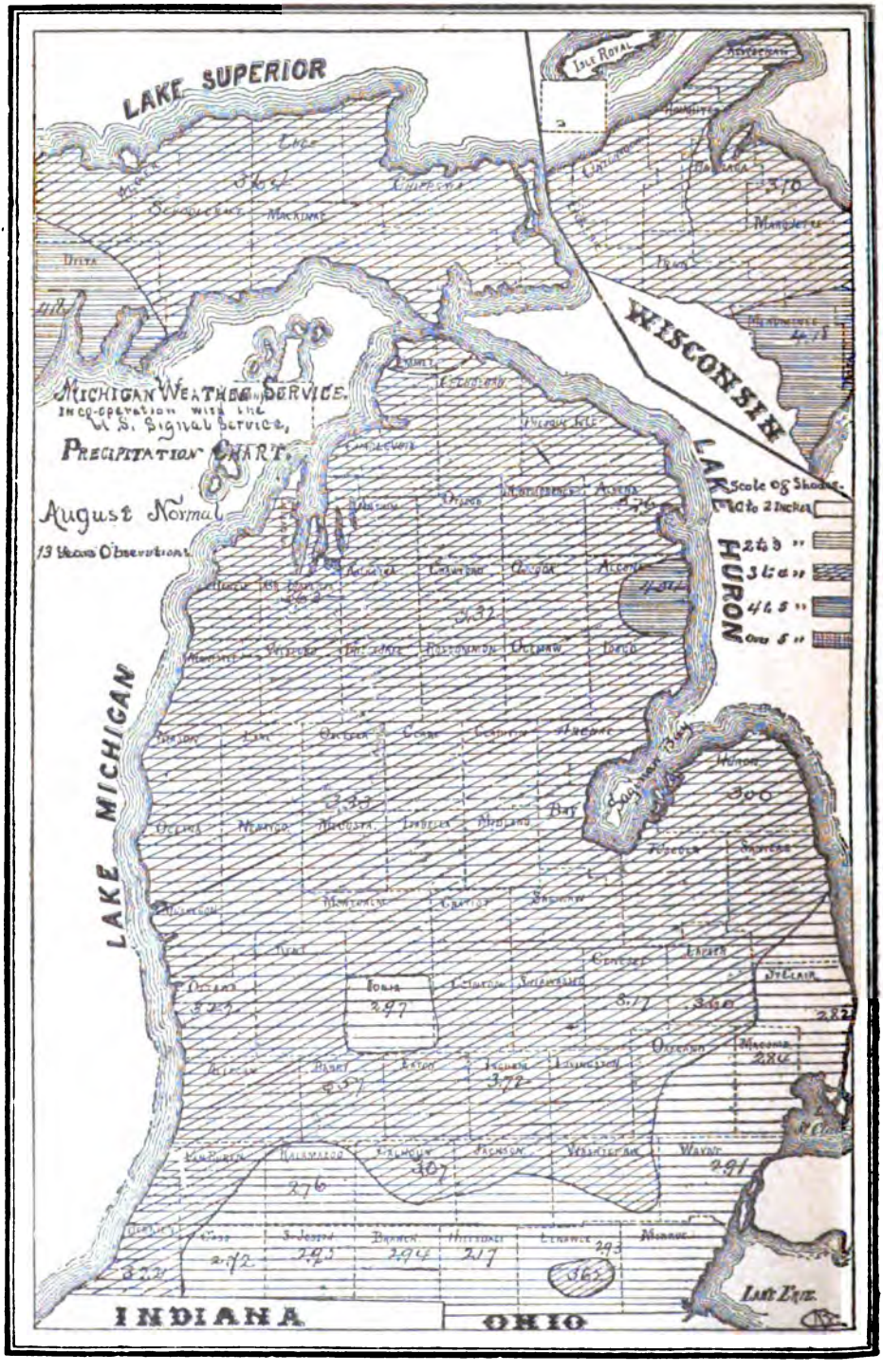

LAKE SUPERIOR
WISCONSIN
LAKE HURON
LAKE MICHIGAN
INDIANA
OHIO
LAKE ERIE
MICHIGAN WEATHER SERVICE
Co-operation with the
U.S. Signal Service
PRECIPITATION CHART
JUNE 1888.
Scale of Shades
0 To 2 Inches
2 to 3 "
3 To 4 "
4 To 5 "
Over 5 "
Mackinac
Chippewa
Iron
Menominee
Manitou
Charlevoix
Antrim
Otsego
Crawford
Oscoda
Alcona
Kalkaska
Grand Traverse
Benzie
Manistee
Wexford
Missaukee
Roscommon
Ogemaw
Iosco
Arenac
Huron
Bay
Tuscola
Sanilac
Mason
Lake
Osceola
Clare
Gladwin
Oceana
Newaygo
Mecosta
Isabella
Midland
Muskegon
Montcalm
Gratiot
Saginaw
Kent
Ottawa
Ionia
Clinton
Shiawassee
Lapeer
St. Clair
Allegan
Barry
Eaton
Ingham
Livingston
Macomb
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Monroe
St. Joseph
Branch
Hillsdale
Lenawee
Isle Royale
Ontonagon
Houghton
Keweenaw
Baraga
Marquette
Schoolcraft
Delta
Alger
Luce
Menominee
Charlevoix
Presque Isle
Emmet
Cheboygan

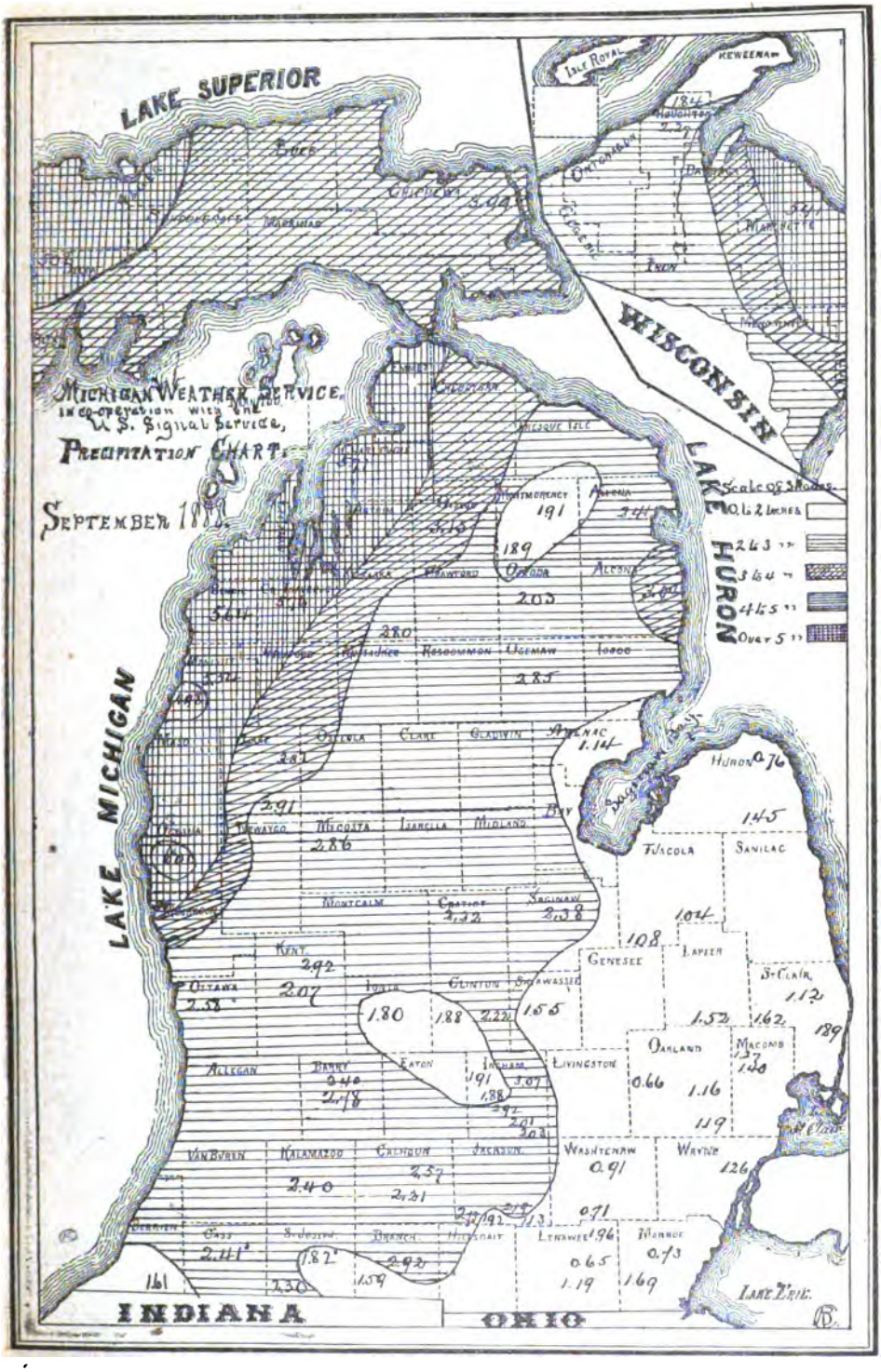

LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
LAKE HURON
INDIANA
OHIO
MICHIGAN WEATHER SERVICE.
In co-operation with the U.S. Signal Service,
PRECIPITATION CHART.
JUNE NORMAL
13 YEARS OBSERVATIONS
Scale of Shades.
Over 5 "

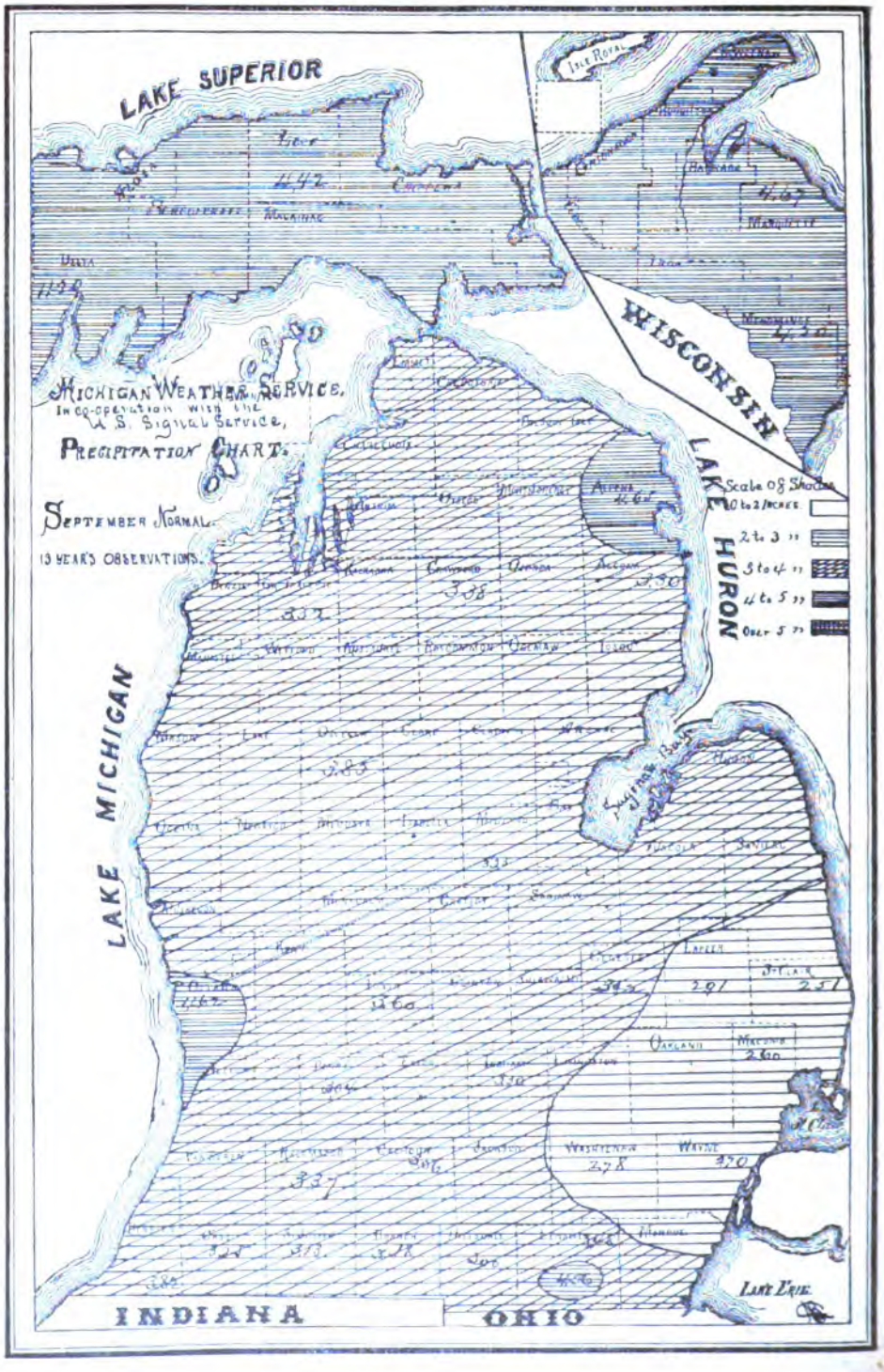

LAKE SUPERIOR
Isle Royal
Keweenaw
Houghton
2.34
0.87
Baraga
1.32
Marquette
Luce
Alger
Schoolcraft
Mackinac
Chippewa
1.09
Ontonagon
Gogebic
Iron
Delta
1.33
Menominee
Wisconsin
Michigan Weather Service.
In co-operation with the
U.S. Signal Service,
Precipitation Chart.
July 1888.
Emmet
Cheboygan
Presque Isle
Lake Huron
Scale of Shades
0 to 2 Inches
2 to 3 "
3 to 4 "
4 to 5 "
Over 5 "
Charlevoix
2.33
Antrim
Otsego
1.16
Montmorency
1.20
Alpena
1.56
Kalkaska
Crawford
Oscoda
1.66
Alcona
1.37
Grand Traverse
1.39
Benzie
2.60
1.26
Leelanau
Wexford
Missaukee
Roscommon
Ogemaw
Iosco
1.57
Manistee
Lake Michigan
Mason
2.35
Lake
Osceola
Clare
Gladwin
Arenac
0.79
Huron
1.20
0.50
Oceana
Newaygo
Mecosta
1.27
Isabella
Midland
Bay
Tuscola
Sanilac
Montcalm
Gratiot
0.94
0.92
Saginaw
Kent
Genesee
1.39
Lapeer
St. Clair
1.85
Ottawa
1.39
Ionia
1.41
Clinton
1.28
Shiawassee
1.92
1.90
Oakland
Macomb
Allegan
Barry
1.43
Eaton
Ingham
Livingston
0.95
1.23
Van Buren
Kalamazoo
Calhoun
0.59
0.93
0.67
1.19
Jackson
0.78
Washtenaw
Wayne
Cass
1.86
1.23
1.57
Branch
0.91
Hillsdale
1.01
Lenawee
Monroe
Lake Erie.
INDIANA
OHIO

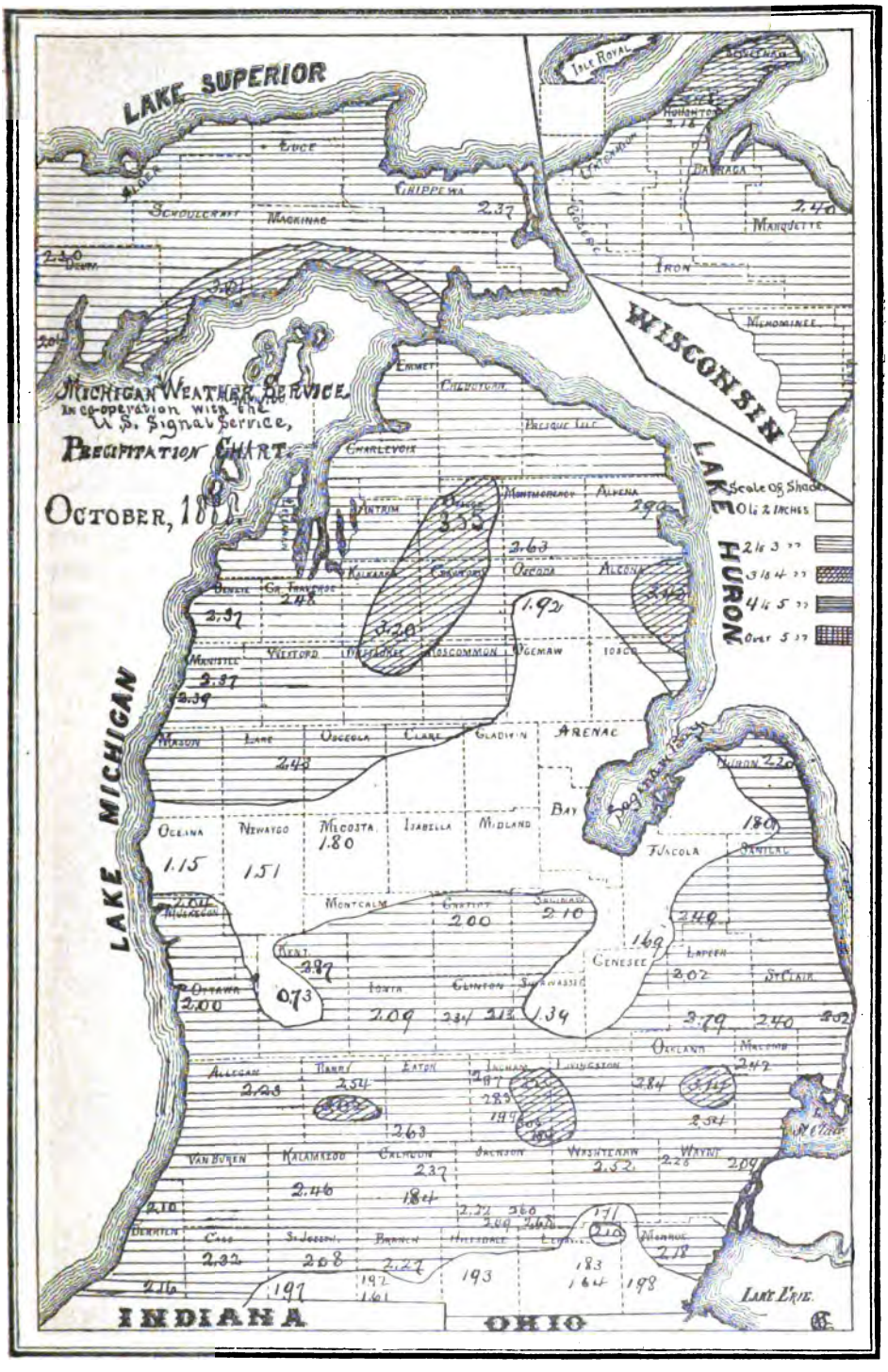

LAKE SUPERIOR
ISLE ROYAL
WISCONSIN
LAKE HURON
LAKE MICHIGAN
INDIANA
OHIO
MICHIGAN WEATHER SERVICE.
In co-operation with the U. S. Signal Service,
PRECIPITATION CHART.
July Normals
13 YEARS OBSERVATIONS
Scale of Shades
Schoolcraft
Mackinac
Chippewa
Delta
Iron
Menominee
Charlevoix
Emmet
Cheboygan
Presque Isle
Otsego
Montmorency
Alpena
Antrim
Kalkaska
Crawford
Oscoda
Alcona
Roscommon
Ogemaw
Iosco
Wexford
Missaukee
Manistee
Lake
Osceola
Clare
Gladwin
Arenac
Saginaw Bay
Huron
Bay
Tuscola
Sanilac
Gratiot
Saginaw
Montcalm
Mecosta
Isabella
Midland
Ottawa
Kent
Ionia
Clinton
Shiawassee
Genesee
Lapeer
St. Clair
Macomb
Oakland
Allegan
Barry
Eaton
Ingham
Livingston
Wayne
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Monroe
Berrien
Cass
St. Joseph
Branch
Hillsdale
Lenawee
Lake Erie

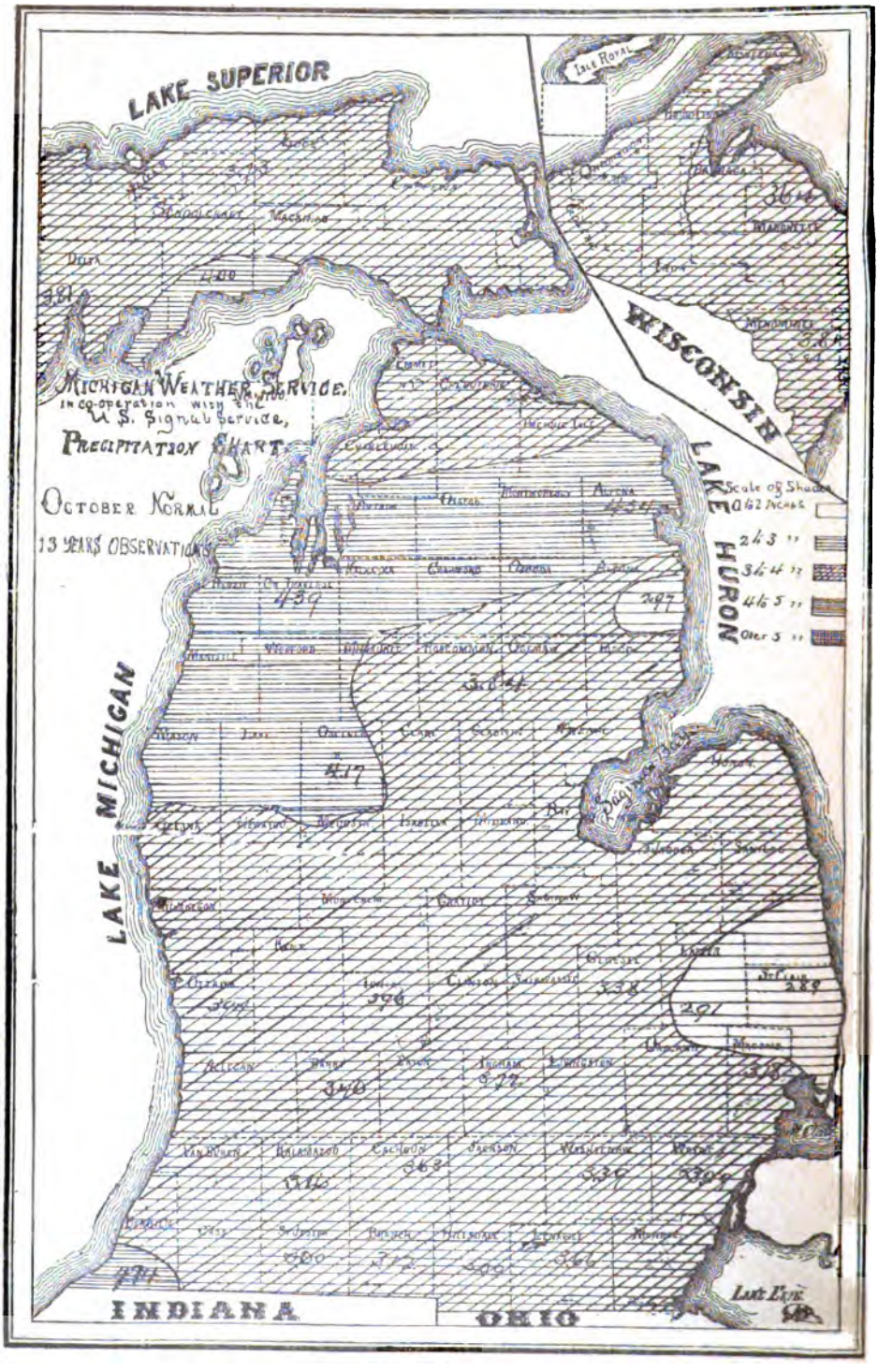

LAKE SUPERIOR
ISLE ROYAL
KEWEENAW
SCHOOLCRAFT
MACKINAC
DELTA
IRON
MENOMINEE
WISCONSIN
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE
U.S. SIGNAL SERVICE,
PRECIPITATION CHART.
AUGUST, 1888.
EMMET
CHEBOYGAN
CHARLEVOIX
LAKE HURON
Scale of Shades
0 to 2 Inches
2 to 3 "
3 to 4 "
4 to 5 "
Over 5 "
LAKE MICHIGAN
BAY
ALLEGAN
BARRY
EATON
VAN BUREN
KALAMAZOO
CALHOUN
BERRIEN
CASS
ST JOSEPH
BRANCH
HILLSDALE
LENAWEE
LAKE ERIE
INDIANA
OHIO

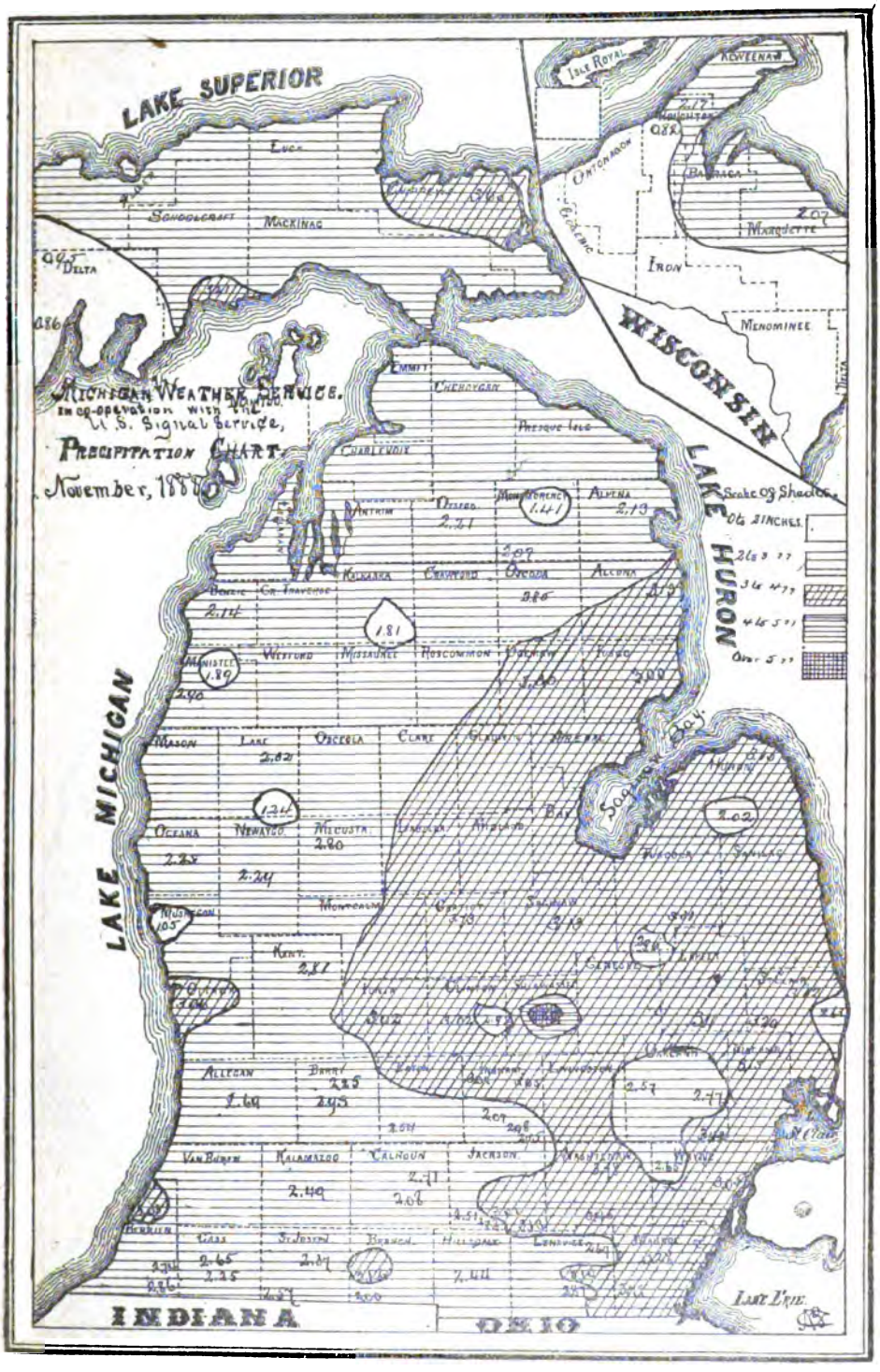

LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
LAKE HURON
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U. S. SIGNAL SERVICE.
PRECIPITATION CHART.
August Normal
13 Years Observations.
Scale of Shades.
INDIANA
OHIO

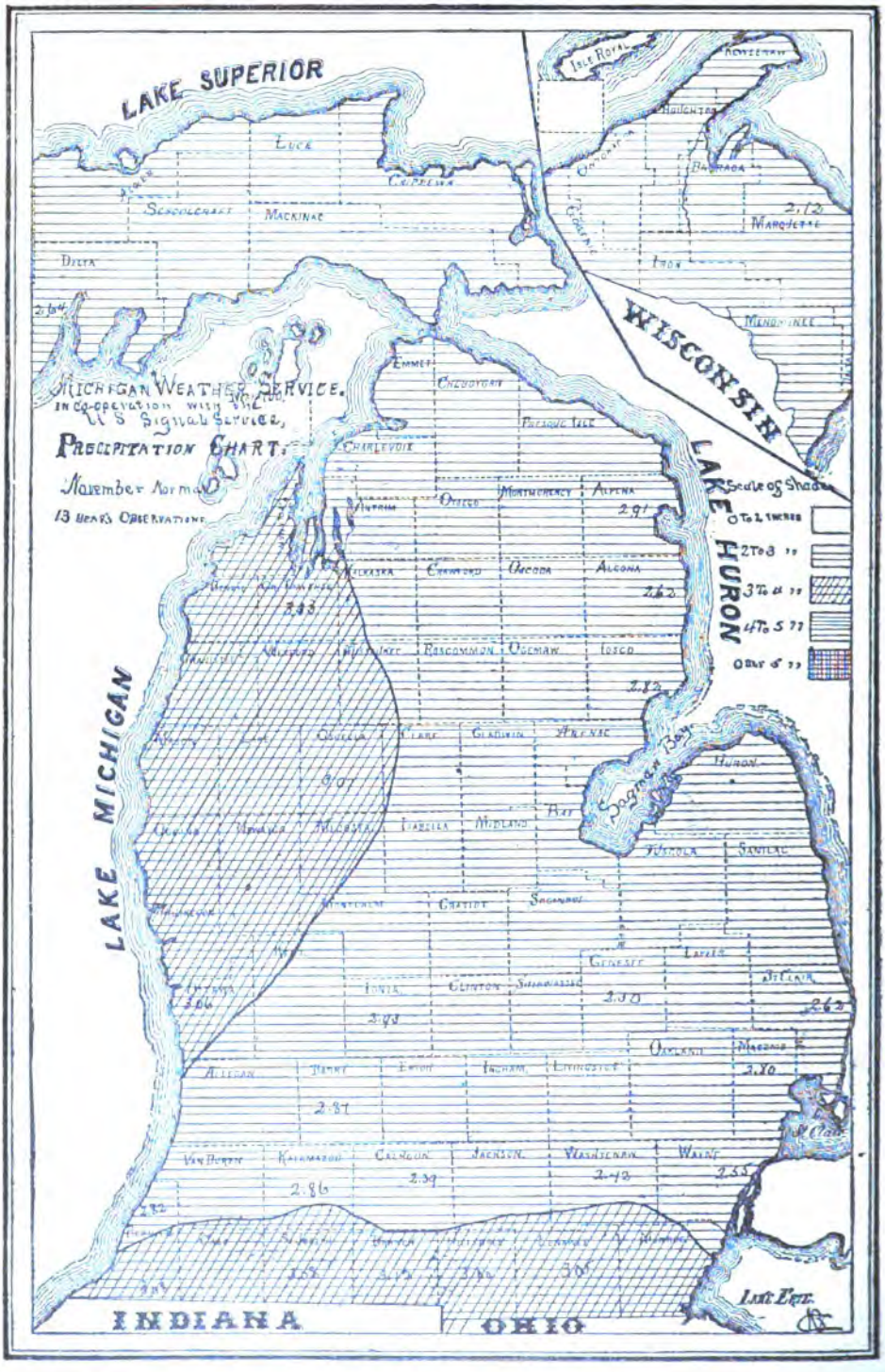

LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
INDIANA
OHIO
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U.S. SIGNAL SERVICE,
PRECIPITATION CHART
SEPTEMBER 1882.
Scale of Shades.
0 to 2 Inches
2 to 3 "
3 to 4 "
4 to 5 "
Over 5 "
Isle Royal
Keweenaw
Houghton
Ontonagon
Marquette
Iron
Menominee
Delta
Schoolcraft
Alger
Chippewa
Mackinac
Luce
Emmet
Cheboygan
Presque Isle
Montmorency
Alpena
Otsego
Antrim
Kalkaska
Crawford
Oscoda
Alcona
Roscommon
Ogemaw
Iosco
Arenac
Bay
Huron
Tuscola
Sanilac
Gladwin
Clare
Isabella
Midland
Gratiot
Saginaw
Montcalm
Kent
Ottawa
Ionia
Clinton
Shiawassee
Genesee
Lapeer
St. Clair
Oakland
Macomb
Livingston
Ingham
Eaton
Barry
Allegan
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Wayne
Monroe
Lenawee
Hillsdale
Branch
St. Joseph
Cass
Berrien

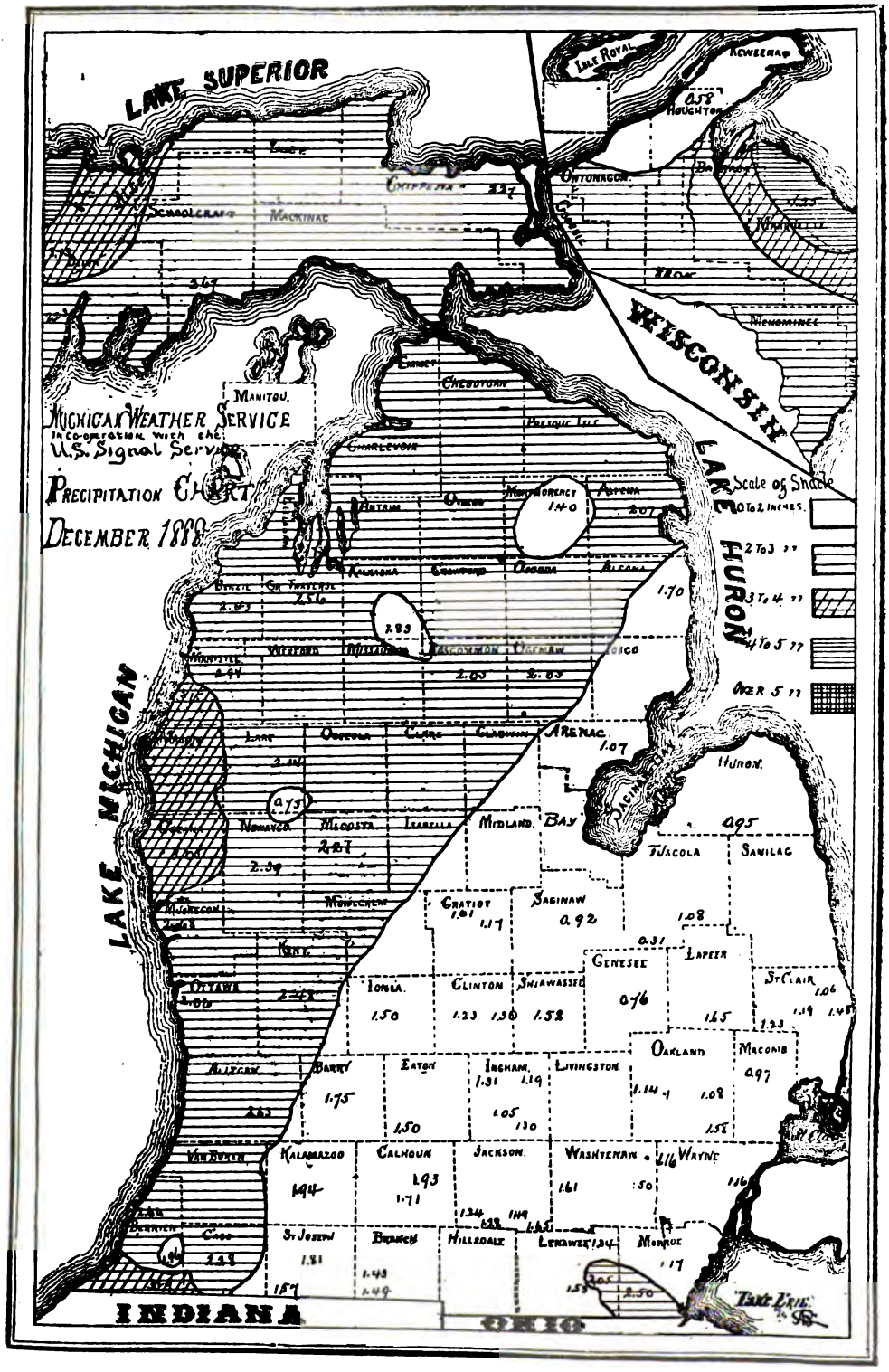

LAKE SUPERIOR
ISLE ROYAL
WISCONSIN
LAKE HURON
LAKE MICHIGAN
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U.S. SIGNAL SERVICE,
PRECIPITATION CHART.
SEPTEMBER NORMAL.
13 YEAR'S OBSERVATIONS.
Scale of Shades
0 to 2 INCHES
2 to 3 "
3 to 4 "
4 to 5 "
OVER 5 "
INDIANA
OHIO
LAKE ERIE

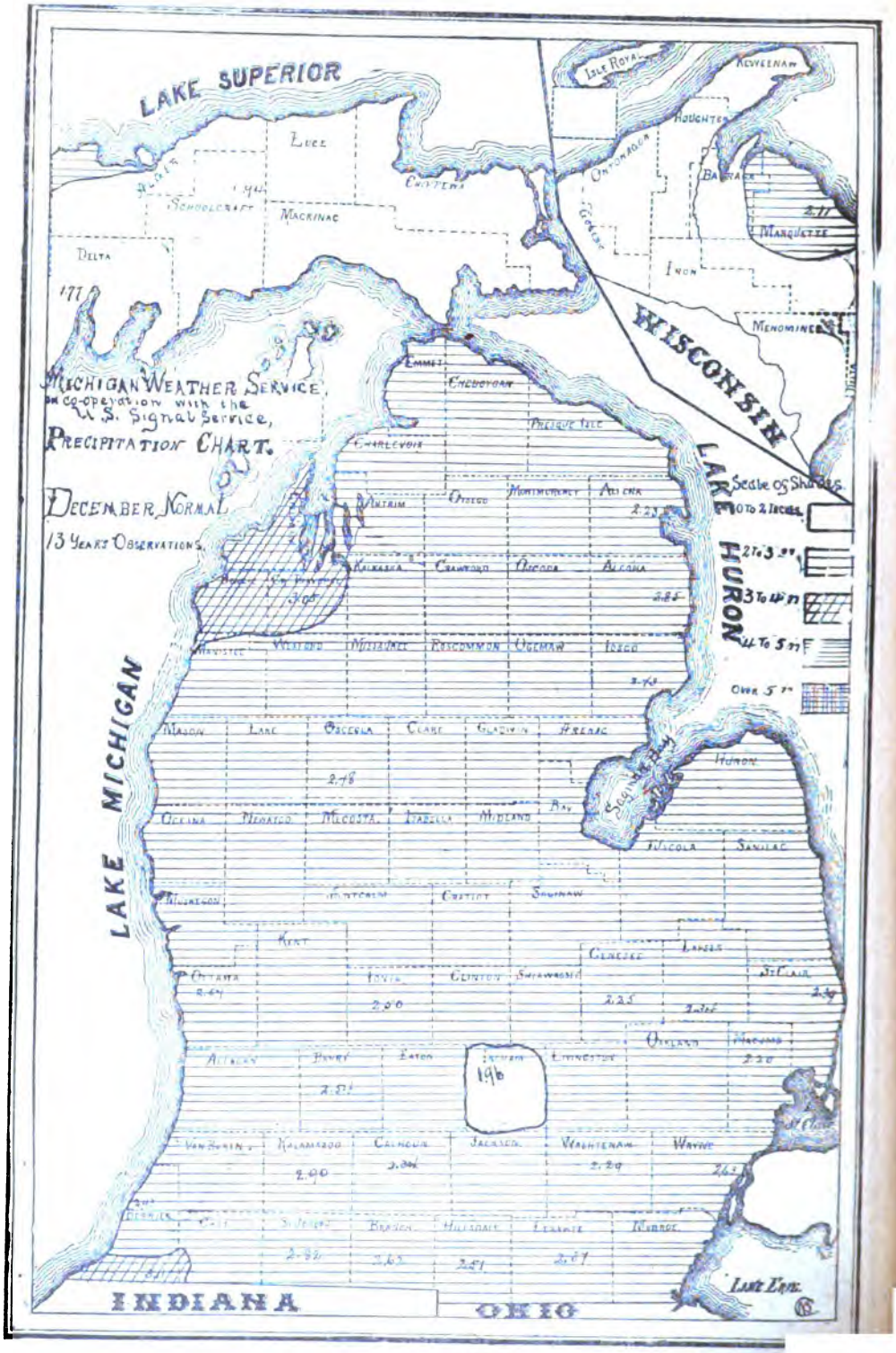

LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
INDIANA
OHIO
MICHIGAN WEATHER SERVICE.
In co-operation with the U.S. Signal Service,
PRECIPITATION CHART.
OCTOBER, 1875.
Scale of Shades
0 to 2 Inches
2 to 3 "
3 to 4 "
4 to 5 "
Over 5 "
Isle Royal
Houghton
Marquette
Iron
Menominee
Delta
Schoolcraft
Mackinac
Chippewa
Luce
Alger
Emmet
Cheboygan
Presque Isle
Charlevoix
Antrim
Montmorency
Alpena
Otsego
Alcona
Oscoda
Crawford
Kalkaska
Grand Traverse
Benzie
Leelanau
Manistee
Wexford
Missaukee
Roscommon
Ogemaw
Iosco
Arenac
Bay
Midland
Isabella
Clare
Gladwin
Osceola
Lake
Mason
Oceana
Newaygo
Mecosta
Montcalm
Gratiot
Saginaw
Huron
Tuscola
Sanilac
Genesee
Lapeer
St. Clair
Shiawassee
Clinton
Ionia
Kent
Ottawa
Muskegon
Allegan
Barry
Eaton
Ingham
Livingston
Oakland
Macomb
Wayne
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Monroe
Berrien
Cass
St. Joseph
Branch
Hillsdale
Lenawee

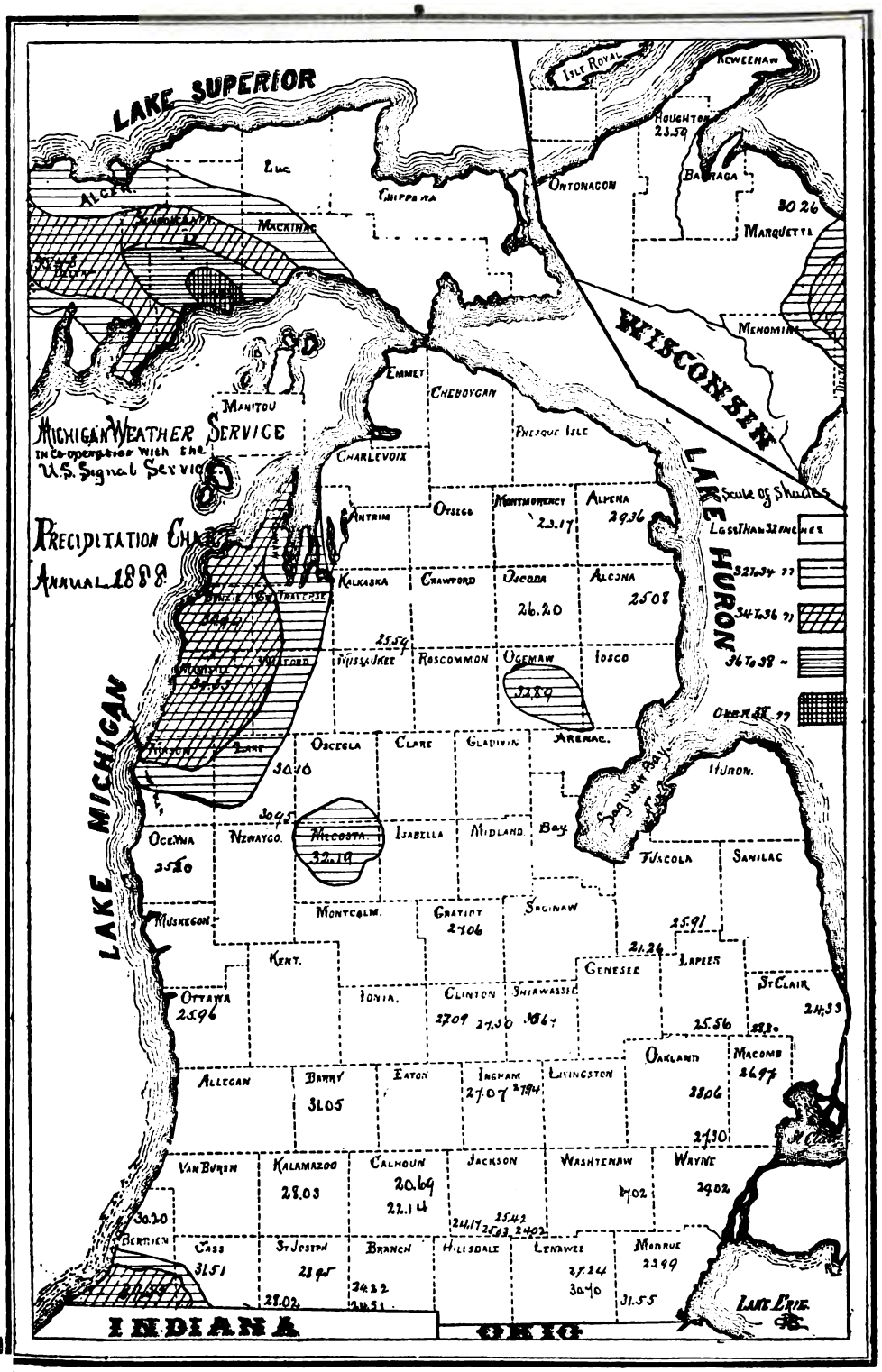

LAKE SUPERIOR
WISCONSIN
LAKE HURON
LAKE MICHIGAN
INDIANA
OHIO
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U.S. SIGNAL SERVICE,
PRECIPITATION CHART.
OCTOBER NORMAL
13 YEARS OBSERVATIONS
Scale of Shades
0 to 2 Inches
2 to 3 "
3 to 4 "
4 to 5 "
Over 5 "
Isle Royal
Saginaw Bay
Lake Erie

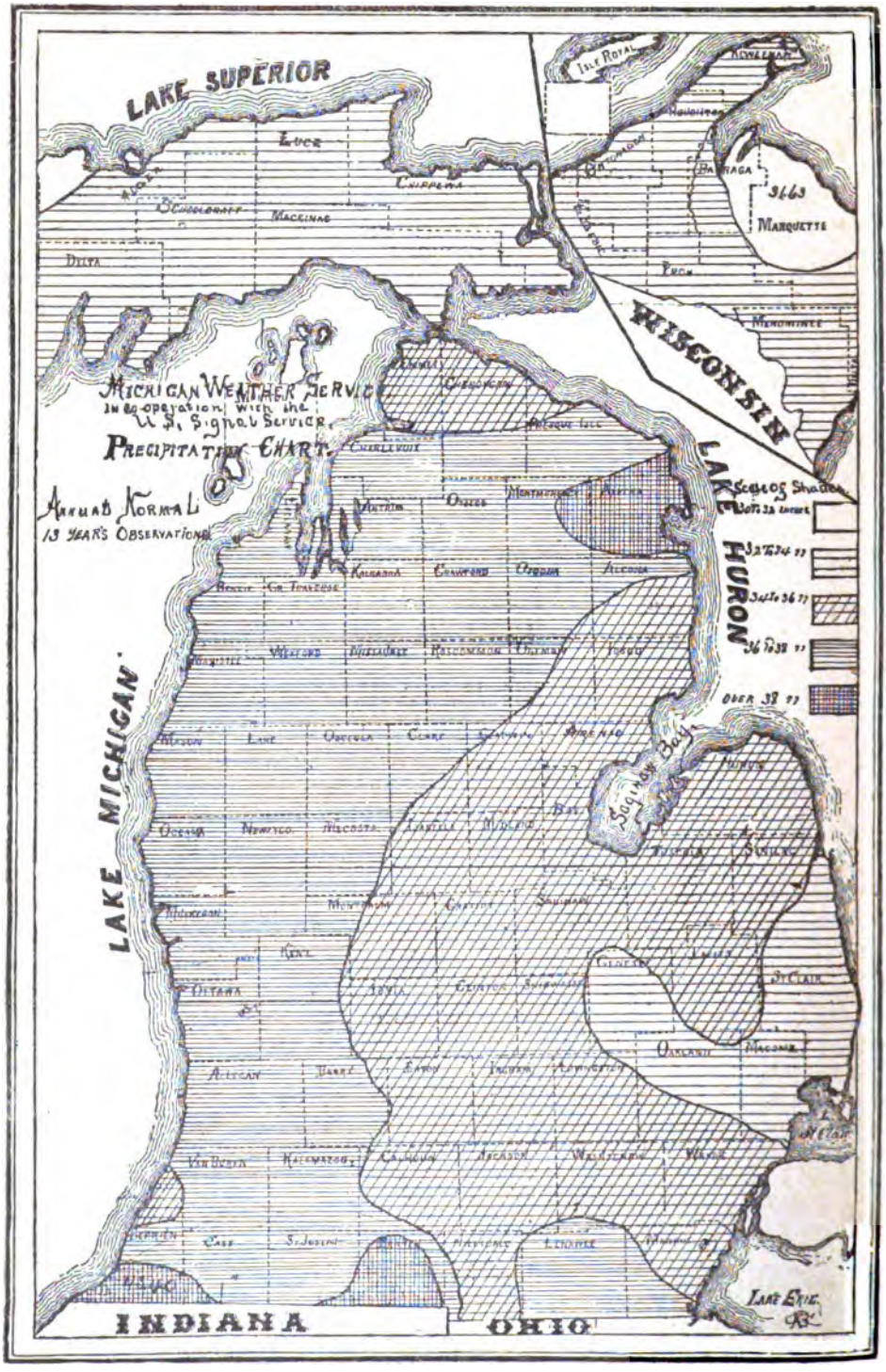

LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
LAKE HURON
INDIANA
OHIO
LAKE ERIE
MICHIGAN WEATHER SERVICE.
In co-operation with the
U.S. Signal Service,
PRECIPITATION CHART.
November, 1880.
Scale of Shades.
04 INCHES.
Over 5 "
Isle Royal
Keweenaw
Houghton
Ontonagon
Baraga
Marquette
Iron
Menominee
Delta
Schoolcraft
Mackinac
Chippewa
Luce
Emmet
Cheboygan
Presque Isle
Charlevoix
Antrim
Otsego
Montmorency
Alpena
Kalkaska
Crawford
Oscoda
Alcona
Benzie
Gr. Traverse
Leelanau
Manistee
Wexford
Missaukee
Roscommon
Ogemaw
Iosco
Mason
Lake
Osceola
Clare
Gladwin
Arenac
Saginaw Bay
Oceana
Newaygo
Mecosta
Isabella
Midland
Bay
Huron
Tuscola
Muskegon
Montcalm
Gratiot
Saginaw
Sanilac
Kent
Ionia
Shiawassee
Lapeer
Ottawa
Allegan
Barry
Eaton
Ingham
Livingston
Genesee
St. Clair
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Wayne
Monroe
Berrien
Cass
St. Joseph
Branch
Hillsdale
Lenawee


LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
LAKE HURON
INDIANA
OHIO
MICHIGAN WEATHER SERVICE.
IN CO-OPERATION WITH THE U.S. SIGNAL SERVICE,
PRECIPITATION CHART.
November Normal
13 YEARS OBSERVATIONS
Scale of Shades
0 TO 2 INCHES
2 TO 3 "
3 TO 4 "
4 TO 5 "
OVER 5 "
Isle Royal
Houghton
Marquette
Menominee
Luce
Chippewa
Schoolcraft
Mackinac
Delta
Iron
Emmet
Cheboygan
Presque Isle
Charlevoix
Antrim
Otsego
Montmorency
Alpena
Kalkaska
Crawford
Oscoda
Alcona
Roscommon
Ogemaw
Iosco
Clare
Gladwin
Arenac
Bay
Huron
Saginaw Bay
Isabella
Midland
Gratiot
Saginaw
Tuscola
Sanilac
Genesee
Lapeer
St. Clair
Ionia
Clinton
Shiawassee
Allegan
Barry
Eaton
Ingham
Livingston
Oakland
Macomb
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Wayne
Lake Erie


LAKE SUPERIOR
WISCONSIN
LAKE HURON
LAKE MICHIGAN
INDIANA
OHIO
Michigan Weather Service
in co-operation with the
U.S. Signal Service
Precipitation Chart
December 1888.
Scale of Shade
0 to 2 inches.
2 to 3 "
3 to 4 "
4 to 5 "
over 5 "
Isle Royal
Keweenaw
Houghton
Ontonagon
Marquette
Menominee
Manitou
Emmet
Cheboygan
Presque Isle
Charlevoix
Antrim
Otsego
Montmorency
Alpena
Kalkaska
Crawford
Oscoda
Alcona
Oscoda
Gladwin
Arenac
Huron
Midland
Bay
Saginaw
Tuscola
Sanilac
Gratiot
Genesee
Lapeer
St. Clair
Ionia
Clinton
Shiawassee
Oakland
Macomb
Barry
Eaton
Ingham
Livingston
Kalamazoo
Calhoun
Jackson
Washtenaw
Wayne
St. Joseph
Branch
Hillsdale
Lenawee
Monroe
Lake Erie
Ottawa
Allegan
Van Buren
Berrien
Cass
Muskegon
Newaygo
Mecosta
Isabella
Mt. Pleasant
Missaukee
Wexford
Grand Traverse
Leelanau
Benzie
Manistee
Lake
Osceola
Clare
Roscommon
Ogemaw
Iosco


LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
LAKE HURON
INDIANA
OHIO
Lake Erie
MICHIGAN WEATHER SERVICE,
In co-operation with the
U. S. Signal Service,
PRECIPITATION CHART.
DECEMBER NORMAL.
13 YEARS OBSERVATIONS.
Scale of Shades.
10 TO 2 INCHES.
2 TO 3 IN.
3 TO 4 IN.
4 TO 5 IN.
OVER 5 IN.
Isle Royal
Keweenaw
Houghton
Baraga
Marquette
Iron
Menominee
Delta
Schoolcraft
Mackinac
Luce
Chippewa
Ontonagon
Gogebic
Emmet
Cheboygan
Presque Isle
Charlevoix
Antrim
Otsego
Montmorency
Alpena
Kalkaska
Crawford
Oscoda
Alcona
Grand Traverse
Wexford
Missaukee
Roscommon
Ogemaw
Iosco
Manistee
Mason
Lake
Osceola
Clare
Gladwin
Arenac
Huron
Oceana
Newaygo
Mecosta
Isabella
Midland
Bay
Tuscola
Sanilac
Muskegon
Montcalm
Gratiot
Saginaw
Kent
Ottawa
Ionia
Clinton
Shiawassee
Genesee
Lapeer
St. Clair
Allegan
Barry
Eaton
Ingham
Livingston
Oakland
Macomb
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Wayne
Berrien
St. Joseph
Branch
Hillsdale
Lenawee
Monroe


LAKE SUPERIOR
ISLE ROYAL
KEWEENAW
HOUGHTON
23.57
ONTONAGON
BARAGA
MARQUETTE
30.26
ALGER
LUCE
CHIPPEWA
MACKINAC
MENOMINEE
WISCONSIN
EMMET
CHEBOYGAN
MANITOU
PRESQUE ISLE
CHARLEVOIX
MICHIGAN WEATHER SERVICE
IN CO-OPERATION WITH THE
U.S. SIGNAL SERVICE
PRECIPITATION CHART
ANNUAL 1888
ANTRIM
OTSEGO
MONTMORENCY
23.17
ALPENA
29.36
LAKE HURON
Scale of Shades
Less than 22 inches
22 to 34 "
34 to 46 "
46 to 58 "
Over 58 "
KALKASKA
CRAWFORD
OSCODA
26.20
ALCONA
25.08
GRAND TRAVERSE
1840
25.59
MISSAUKEE
ROSCOMMON
OGEMAW
32.89
IOSCO
WEXFORD
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC.
HURON.
LAKE MICHIGAN
MANISTEE
30.46
30.95
OCEANA
25.20
NEWAYGO.
MECOSTA.
32.19
ISABELLA
MIDLAND
Bay
SAGINAW BAY
TUSCOLA
SANILAC
MUSKEGON
MONTCALM.
GRATIOT
27.06
SAGINAW
25.91
21.24
KENT.
GENESEE
LAPEER
ST CLAIR
24.33
OTTAWA
25.96
IONIA.
CLINTON
27.09
27.30
SHIAWASSEE
25.56
OAKLAND
MACOMB
24.97
ALLEGAN
BARRY
31.05
EATON
INGHAM
27.07
27.84
LIVINGSTON
23.06
27.30
VAN BUREN
KALAMAZOO
28.03
CALHOUN
20.64
22.14
JACKSON
24.17
25.42
25.43
24.02
WASHTENAW
WAYNE
24.02
30.20
BERRIEN
CASS
31.51
ST JOSEPH
28.95
28.02
BRANCH
24.22
24.51
HILLSDALE
LENAWEE
27.24
30.40
MONROE
23.99
31.55
LAKE ERIE
INDIANA
OHIO


LAKE SUPERIOR
WISCONSIN
LAKE HURON
LAKE MICHIGAN
INDIANA
OHIO
LAKE ERIE
MICHIGAN WEATHER SERVICE
In co-operation with the
U. S. Signal Service
PRECIPITATION CHART.
ANNUAL NORMAL
13 YEAR'S OBSERVATIONS
Marquette
Saginaw Bay
OVER 38 "

THE CONSERVATION OF WATER.

BY D. G. ARNOLD, PONTIAC.

Modern science has demonstrated the doctrine of the conservation of energy, which may, and probably does explain many of the heretofore mysterious operations of nature's forces. The actual worth of the discoveries made by science will be measured by their relative value in promoting the general welfare of the human race. The fact that many of our most dangerous diseases are caused by microscopic living germs in the human organisms, and that those germs can be destroyed and the disease thereby eradicated, is of infinitely more value to us than to know that the sun is a vast mass of conserved energy or force which in time will be expended, with the natural sequences, a dead world and chaos generally.

Now, in treating the subject of the conservation of water, I make no claim to the discovery of any new force, or of the heretofore unknown operation of any known force now existing; but shall endeavor in a general way to briefly speak of water as nature's great factor in the universe and also of the results accruing to mankind, who through ignorance or thoughtlessness, ignore nature's methods. And I further hope to show in this paper that in some localities at least, it is possible that water may be so *conserved* that a drouth, often amounting now to almost a national calamity with the accompanying horror of *fire*, may become as a thing of the past. As the blood that courses our veins is the great solvent (and our blood is 90 per cent water), holding in solution the nutritious elements that sustain life, so is water the life blood of our universal mother earth. A plant or flower cannot thrive until its food has been properly prepared; or, more plainly speaking, until the soil, its food, has been rendered possible for assimilation by being dissolved in nature's universal solvent, water.

Man in his struggle for existence is fast denuding the earth of her protecting robes, and those giant sentinels of the forest who with outstreched arms and sheltering leaves for untold ages have guarded and conserved the moisture that formed the life blood that coursed their veins, fall before the ax of the sturdy pioneer, and the deadly fire completes the work of their extermination. The rising sun is greeted not as heretofore by feathered songsters in their green leafed bowers; but in their stead lies a charred and blackened waste. His fierce and ardent rays, which hitherto had quickened the life blood of every tree, shrub, and flower, are now thrown direct upon the unprotected bosom of mother earth. Nature's law must be obeyed, and *evaporation*, swift and sudden, takes place. The life blood is hurriedly withdrawn, and, ascending, is caught by the winds of heaven and hastened away from the scene of nature's desolation possibly to be condensed as a flood by some high mountain hundreds or even thousands of miles from its point of departure. The mission of the earth, now controlled and subdued by the hand of man, is of a new character. Her *vesture* is changed. The swaying forest is replaced by fields of waving green. The water-courses are carefully cleared and opened, and the draining tile permeates every spot considered the least too wet; and should a shower fall it is caught and hurried

off to some natural reservoir—be it brook, lake or river, there again to be as hurriedly evaporated, and possibly to be condensed as a flood among the Pennsylvania hills.

But I will not dwell longer in speaking of phenomena with which you are all familiar, but will at once approach the practical point of the subject of this paper, namely, the conservation of water, and will take our own county as a base of operations. Oakland county has 300 lakes set like silver mirrors in its gently undulating surface; and yet we often witness the spectacle of dry and parched fields in lieu of mantles of living green. And neighbor meets neighbor, not with the cheerful greeting of "a fine growing time, neighbor," but the salutation is "this is a terrible drouth—seems as if it never would rain again." And now I am going to *imagine* a little, and will suppose two neighbors meeting. They have exchanged salutations, as above, and are talking of the general desolation of things attending the drouth. They are standing in a large and naturally fertile field on the bank of a beautiful crystal lake only a feet below them, and as the "ancient mariner" in mid-ocean, suffering the horrors of thirst, exclaimed: "Water, water everywhere, nor any drop to drink," so might these good men exclaim: "Water, water at our feet, yet our crops die of thirst." Now we will imagine a little more, and suppose that many years ago one of these men cleared the field in which they are standing, and as he considered it a rather wet piece of land, tiled it very thoroughly—he had a splendid outlet in the lake at his feet. Suppose, instead of draining directly into the lake, he had led his numerous tile drains into one main ditch or reservoir,—that emptying into the lake. Now, when the dreaded drouth is approaching he closes the outlet of his main ditch or reservoir and with a pump of sufficient power he raises the water of the lake back into the reservoir, which, seeking its level, follows back the tile from which it was so rudely ejected, and there, being *conserved*, is an obedient servant to the wants of man. Obeying the law of capillary attraction, it permeates every particle of the soil, and with evaporation constantly drawing it upward, it is caught and utilized by the hungry mouths of millions of tiny rootlets; and the loaded heads of grain above bow in welcome gratitude.

I can readily conceive that two pertinent questions may now be asked, namely, will this method of conserving water produce the desired results; and will not the expense be too great to render it practicable? To the first question I would answer: There is a tract of 700 acres of land in the Saginaw valley, known as the "McGraw farm." I recollect it 20 years ago as a vast marsh; today it stands, in my judgment, as the model farm in Michigan. I visited it two years ago, knowing it could be irrigated in the manner I have described. A portion of this farm lies below the level of the Saginaw river, and is protected from high water by embankments. At the time of my visit I found the gates open, and the river's waters doing their work, in the numerous under-ground drains, of producing a bountiful crop above, and the gentlemanly superintendent of the farm, Mr. Azure, informed me "that they knew nothing about drouths, for in three days after letting the river in the ditches, the fields would be as green as a leek."

Now, as to cost, very much will depend on location and the "lay of the land." With a natural or artificial head, say a lake in the hills or a river dammed, all pumping could be dispensed with; the water conveyed in races and let on and utilized as needed. Undoubtedly this scheme of draining

and irrigating would cost much money; but are not drouths also very expensive? Take the loss on the two crops of corn and potatoes alone in Oakland county this year (I have no statistics to guide me) as compared with the crop which might have been reasonably expected had there been sufficient rain, I venture the assertion that the value of the shortage, figured in dollars, would build many miles of ditches, and pump several lakes dry, if necessary.

But I will not dwell longer on the subject. I started out to show that the primeval forests are nature's great conservators of water; they disappear before the hand of man, but he finds the drop of water as necessary to form the life blood of a blade of grass, as of the giant oak or towering pine; and having opened up the avenues for rapid evaporation, he must restore the equilibrium by providing *storage*. Then will the "wilderness blossom like the rose" and a drouth become a thing of the past.

DISCUSSION OF METEOROLOGY AND DISEASE.

BY A. ARNOLD CLARK, LANSING, MICH.

Dr. Johnson once said that, when two Englishmen met, they always commenced talking about the weather,—each trying to tell the other something which neither knew anything about. It seems perfectly proper that we should have a paper here on this subject in which all of us have taken such a deep interest under more or less embarrassing circumstances—and from one who does know something about it.

The villages in India have an official whose duty it is to make rain. They call him a gapogari. In times of drouth he is led forth every morning and pounded. So we have such an official in Michigan. Mr. Conger is our gapogari, only his duty is not to make rain but to discover how nature does it. We never pound him. We are civilized enough to know that, no matter how many rain flags he puts up, he can not make it rain.

Now the difference between the Indian gapogari and Sergt. Conger is the difference between the meteorology of the past and the meteorology of the present. A century ago it was believed that rain was the work of devils. A century ago a book was published entitled "Hand-book of prayers against bad weather with sighs for use when it lightens fearfully." They used to ring consecrated bells to stop a storm. Prof. White tells of a monastery built only 15 years ago off the southern coast of France where a sacred bell was put in and baptized by four bishops with a formula stating that it would drive off tempests, but—high above the bell and the spires—was a lightning rod.

The barometer and the thermometer—instruments for measuring the weight and heat of the atmosphere—are only two hundred years old and the great science of meteorology is a very modern one.

But I was asked today,—why should we discuss this subject at this Convention? What has the weather to do with sanitary science? In the first place your city could not lay a sewer or drain unless you knew the average

rainfall and the greatest single rainfall. So the scientific farmer must know about the different soils, the amount of moisture they will absorb—the influence of forests on temperature, on wind and frost, on rain and drouth. Now, not only his crops but his health as well depend on climatic conditions.

We often hear rheumatic people say that they can foretell a storm. So men are in low spirits when the barometer is. But there are other more intricate connections between climate and health, which are now matters of proof. For example cholera always follows a light rainfall and typhoid fever occurs when water in wells is low. We can predict pneumonia in January just as certainly as we can predict cold weather and just because we can predict cold weather.

The Secretary of the State Board of Health has collected statistics concerning thousands of deaths, thousands and thousands of cases of sickness and hundreds of thousands of observations of temperature, and from their comparison has been able to prove that pneumonia invariably increases as the temperature falls. This evidence has been grouped, in the form of a diagram, for each of many different diseases.

ATMOSPHERIC TEMPERATURE AND PNEUMONIA.

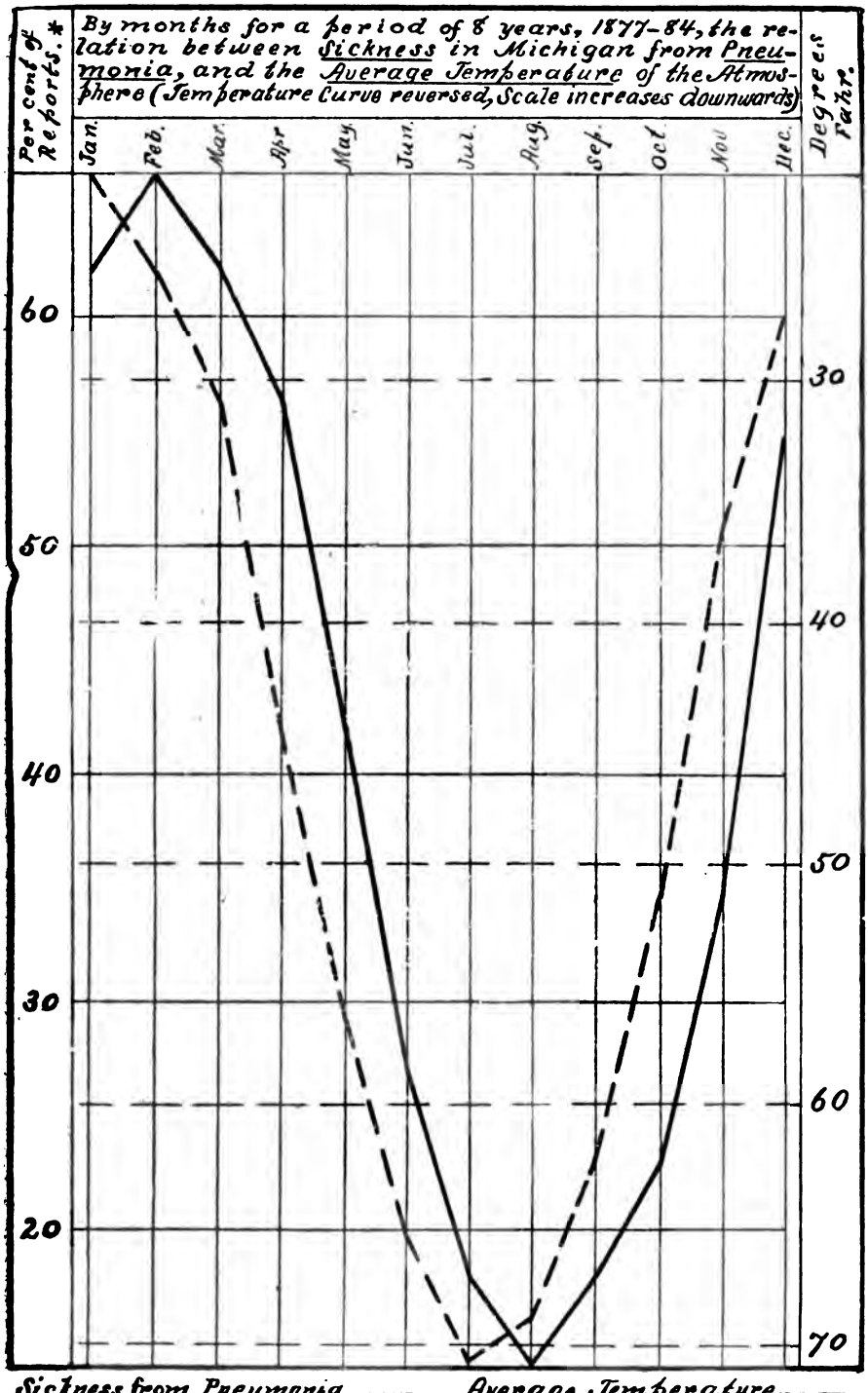
TABLE—*By months for a period of eight years, 1877–84, the relation between* SICKNESS *from* PNEUMONIA *and the average temperature of the atmosphere, in Michigan.*

	Average.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Sickness from Pneumonia*	39.	62.	66.	62.	56.	42.	27.	18.	14.	18.	23.	35.	48.
Atmospheric Temperature†	46.74	21.43	25.60	31.04	44.48	56.60	65.54	70.68	68.85	62.05	51.84	35.99	27.25

* Indicating what per cent of all reports received stated the presence of pneumonia then under the observation of the physicians reporting.

† The average temperature is stated in degrees Fahr., and is for groups of several stations in different parts of the State.

NOTE.—Here is a table exhibiting such evidence relative to atmospheric temperature and sickness from pneumonia; and, on the opposite page, is a diagram exhibiting the same evidence in a graphic and easily apprehended form.



Sickness from Pneumonia ———. Average Temperature — —.

*Indicating what per cent of all reports received, stated the presence of pneumonia then under the observation of the physicians reporting.

Over 30,000 weekly reports of sickness, and over 150,000 observations of the atmospheric temperature are repre-

From the accompanying diagram you will see that there was in January an average temperature of about twenty degrees and a large amount of pneumonia (following about a month later), in February it has become warmer and the line representing the amount of pneumonia soon falls, in March it is still warmer and there follows still less pneumonia, and so on until the highest temperature is reached in July (the temperature curve being inverted—and increase of temperature being represented by a descending line) and the least amount of pneumonia in August,—the disease following regularly about a month behind the cold. Then it begins to get colder in August and the pneumonia commences to increase, and it steadily gets colder and colder and the pneumonia gets more and more prevalent until the next January. This relation holds for other diseases of the lungs and air passages. Even the germ diseases are influenced by the temperature. No one doubts that small-pox and scarlet fever are communicable diseases—caused by a living germ, and yet (like pneumonia) small-pox, scarlet fever, diphtheria and consumption follow the curve for temperature—increasing in prevalence as the air gets colder and colder. The lungs at this time are in better condition to receive the germ,—being irritated or "chapped" as we say of our hands.

There are other diseases which rise with the *warm* weather—cholera infantum and kindred diseases. Children die largely in the summer time. Buchan and Mitchell have shown that in New York twice as many children under one year of age died in July as in any other month. Old people die from the cold-weather diseases. Dr. Farr showed that after twenty years of age the danger of dying from a fall in temperature was doubled every nine years.

Now, you say the seasons will continue to come and go, we cannot hope for July weather in December, or to control the forces of nature which are beyond our reach. What does this amount to at a sanitary convention whose object is to *prevent* sickness? True, but we can avoid these conditions in winter. We may be particularly careful about exposure to the communicable diseases in the winter; we may guard our drinking water-supply in the summer. Not long ago it was desired to move the body of a person dead three years from diphtheria, in December, but when it was known that there was more danger of the disease spreading in the winter the exhumation was postponed until the next summer.

It is likely that all meteorological phenomena have more or less intimate bearing on health and disease. Just what this bearing is we cannot say until large numbers of statistics have been gathered together and the conditions compared with disease. Then we may know just how certain diseases are controlled by the weather. Some people see no use in statistics. You know when Faraday was asked "What is the use of statistics?" he replied, "What is the use of a baby?" In it are bound up all the possibilities of the future. The scientific physician without statistics is like an astronomer without a catalogue of stars.

There are many diseases concerning which there is a doubt whether they are entirely climatic or are due to a germ. Is malaria simply mal-aria—"bad air?" Is it caused by the *bacillus malariæ*, or the malarial germ of Laveran, or is it simply due to great daily fluctuation in the temperature, or is it due to both? And how can we hope to prevent it until we know how it is caused?

What is the action of that powerful element, ozone? Does it cure disease or cause disease? No one knew anything about it until fifty years ago.

Benjamin Ward Richardson, M. D., writing of the absence of electricity in the atmosphere when cholera is at its maximum, says: "If we consider that every living creature is as much an electrical machine as each cloud; that the earth itself is the largest and most powerful electrical machine of all; that all things are always exchanging their electricities with each other, and that lightning destroys myriads of insects as well as some animals and human beings, at a single flash, it is past contradiction that electricity must be a grand actor in every form of life, whether of health or disease."

When we think of this great world in which we live,—these great belts of temperature—these belts of barometric pressure—these different systems of winds,—how like the plaything of nature man seems! And yet the secret of long life is to adapt ourselves to our environment. We must learn that the human body is a delicate instrument which responds to changes in temperature and the weather as truly as the thermometer and the barometer, and that there is no phenomenon of nature which has not an intimate connection with our well-being.

THE HYGIENE OF SCHOOL BUILDINGS.

BY PROF. HUGH BROWN, PONTIAC.

Before people sufficiently interested in the matter to attend the meetings of a sanitary convention, it will be unnecessary to make an elaborate statement of the desirability and need of proper hygienic arrangements in our school buildings. Yet, notwithstanding our apparent interest in securing healthful surroundings for our school children, there is much unsound theory working itself out into practice in the building and arrangement of Pontiac school-houses. Indeed in some respects they are so poorly planned and constructed that only a culpable ignorance or negligence on the part of the authorities can long permit their continuance without some attempt to remedy their defects. What these defects are will appear in the sequel. The mistaken notion that a well constructed house costs more to build and maintain than a poorly constructed one may lie at the root of not a little of our willful ignorance and unsound practice in this as in other matters.

The points to be considered in the discussion of this subject may be arranged under the following heads: Site, construction, lighting, heating, ventilation, and water-supply. Inasmuch as the last of these has been fully treated in a special paper on the subject, I shall omit all consideration of it.

It ought to be unnecessary to urge upon a community the need of exercising the greatest care in the choice of a site for a school building. High ground easily drained, pleasant and healthful surroundings, sufficient room, absence of noise from the nearness of heavy street traffic and factories; all these, desirable for a dwelling house, are certainly needed in a school building.

In the construction of school buildings, especially those in the rural and village districts, we have much to learn. Below the foundation walls should be a trench filled with loose stone and connected with a drain leading to a lower level, in order that water settling down outside the walls may be prevented an entrance into the basement or space under the house. To further facilitate drainage and insure dryness under the building the outside of the foundation wall should be pointed up smooth with cement, and a small space left between the wall and surrounding earth filled up with loose stones. An outside surface roughly finished with absorbent mortar in contact with wet earth forms an excellent transmitter of moisture to the inside of the foundation walls. As a further precaution against dampness one or two layers of brick at the upper part of the foundation should be laid in a cement impervious to moisture, thus overcoming any tendency of moisture to rise by capillary attraction.

If the building is to be of brick the walls should be hollow. The air space will more effectually keep out the cold than the extra thickness of brick, and in keeping out the cold will prevent the disagreeable winter sweating of brick walls.

If the house is frame it should have one layer of sheathing on the studding, over this a layer of felt paper, and then over this the common weather boarding. There is a great deal of preventable waste of heat and consequently of fuel, to say nothing of the discomfort caused by wind and snow working their way into the hollow wall of a frame building. All windows should be either double-glazed or glazed with double thick glass.

Doors should open outward as a precaution againt panic in the case of fire.

Seats must be adapted to the height of the pupil. Where for any reason a seat too high for the pupil must be used, a foot rest should be provided. Generally the seat is too far removed from the desk, so that the pupil must lean over his work, thus encouraging any tendency to round shoulders. With the present mode of construction I am not sure that this can be avoided.

Authorities are quite generally agreed that the best light for study is that that comes from the left and back and upper part of the room. When possible, without leaving any part of the room too far removed from the source of light, the windows should be thus placed. Whatever may be said of the architectural effect of thus bunching windows in one corner of the room, its hygienic desirability is pretty generally admitted. The magnitude of the evil of bad light is not appreciated possibly because the bad effects are slow in manifesting themselves.

The light from the north as being more uniformly diffused through the room is the best. Next to this is the light from the south. The long horizontal rays of the morning and afternoon sun reach far into the room and produce a glare that makes light from either the east or the west poor.

As to ventilation I hardly know what to say. The knowledge of the masses in regard to air, its composition and changes is so vague and uncertain that any statement of the principles of ventilation and their application without some very elementary illustrations would be useless.

[The speaker here performed experiments showing that by breathing in a closed jar, and placing a lighted match in the jar there was not enough oxygen left to support combustion. It would be the same with a mouse

if he had one to place in the jar. It would be the same with a person shut up in a room without any ventilation.]

Normal out-door air contains, in each 10,000 volumes, 2,096 volumes of oxygen, 7,900 volumes of nitrogen, and 4 volumes of what is known as carbonic acid gas. In the act of respiration there is taken from the air some of its oxygen and there is added to it a small amount of carbonic acid gas and animal matter. Since the carbonic acid gas and animal matter are deleterious, it becomes necessary to make some provision for their removal, or for the dilution of the air with such an amount of new air as to render these matters harmless. When the respired impurity reaches two parts per ten thousand, the air begins to be close and oppressive. A person breathes out during one minute about twenty cubic inches of carbonic acid gas, an amount which, in the proportions we have assumed, would render unfit for breathing about sixty cubic feet of air. Each individual, then, must have sixty cubic feet of air per minute or 3,600 cubic feet per hour if the impurities breathed out are to be diluted to the point where the air containing them will be unquestionably wholesome. Suppose that we allow only half this amount, or 1,800 cubic feet per man per hour. For a school of fifty pupils air must be admitted at the rate of 90,000 cubic feet per hour, or 1,500 cubic feet per minute, and a like amount must be allowed to escape.

Not only must openings be made for an inflow and an outflow of air, but provision must be made to have the air pass through these openings, and that in the right direction. Movement of the air can be secured by means of fans, but ordinarily such appliances are out of the question, and we are compelled to depend on currents produced by the buoyancy of heated air in tall flues. Contrary to the general notion, a flue, in itself, has no more power to produce a current of air, than a lightning rod has. It is only when the inside air is heavier or lighter than that outside that we can have a current. This difference in weight results from a difference in temperature, warmer air, as is generally known, being lighter than cold air. The greater the difference in temperature between the air inside the flue and that outside, the greater the difference in weight, and hence the greater the motive force tending to produce a current. If a ventilating shaft is always to be depended upon, there must be some means of warming the air in it. Ordinarily this can be secured by having the ventilating and smoke flues in close contact. The waste heat of the smoke and consumed gases can thus be utilized. The essential weakness of this system lies in the fact of its inapplicability when it is most needed. In the spring and fall when it is too warm for a fire and too cool to permit of the windows being opened, the difference between the inside and outside temperatures will be insufficient to cause a current of sufficient velocity to change the air of the room. The shaft can be warmed by a small furnace or by a large gas jet, the former being, I am sure, the most economical.

But what about rooms heated by stoves? Can they be successfully ventilated? If a stove has around it a jacket inclosing an air space that communicates with the outside air there is afforded as near an approach as possible to the conditions of a furnace heated room.

I shall not be able to notice as fully as I had expected the hygienic condition of the Pontiac school buildings. A few points on ventilation and lighting will suffice. As originally planned there were some good features

in the heating and ventilation of the Grove building. Hot air was to enter the room near the ceiling. After diffusing itself through the upper part of the room a downward current would be caused by the windows and outside walls and the side opposite the inlet. The outlet was on the same side as the inlet but near the floor, so that the air had to make a complete circuit of the room before it was permitted to escape. Yet for some reason, —the insufficiency of heating surface, or the inadequacy of the outlet, the system was discarded.

The building is now heated by steam pipes placed on three sides of the room, the ventilating flues remaining as before. The air heated by contact with the pipes rises and remains near the ceiling until it is cooled, or displaced by other hotter air. In time it works its way down to the floor to be heated again. There is a bare possibility that part of it will escape through the outlet near the floor. Whatever motive force the air possesses is exerted in raising itself to the ceiling. This ascensional force in the room produces a suction at every chink and crevice in the lower part of the room, so that the probability is that the ventilating flues will work backwards if they work at all; the chances being in favor of their not working at all. Of course there are the windows to fall back upon. But if the community knew how much out-of-doors they were taxed to heat by reason of the inadequacy of the ventilating apparatus a reform would soon be called for.

In what is known as the Pike street and the Bunker Hill schools where the rooms are warmed by stoves, I find fresh air supplied by a duct of about 4x5½ inches, internal diameter. This duct communicates with the out-door air at one end, at the other it divides into two branches, one leading to each of the two rooms. In the rooms these ducts communicate with a hot air space around the stoves.

In the two rooms there are not less than one hundred children to be supplied with air by means of a pipe with a sectional area of 22 sq. inches. If we allow to each pupil 25 cubic ft. of fresh air per minute, the total amount required for the one hundred will be 2,500 cubic ft. To supply this through a duct with a sectional area of 22 sq. inches, there must be a current of about 16,000 ft., or three miles a minute. There are other admirable features to this modern and highly ingenious system of heating and ventilating. There is free communication between the hot air spaces around the two stoves. When one is a little warmer than the other it stands a good chance of getting all the fresh air that comes through the pipe and nearly all the heat that is generated by the other stove. There will be a constant see-sawing kept up between the two rooms, each alternating with the other in being too hot or too cold. And lest at any time the children be overwhelmed by a supply of fresh air, the ingenious and considerate contriver of this system of ventilation has placed in the flue a gate with which at his option the teacher may further limit the supply of oxygen.

In our newest building we would expect some application to be made of the generally accepted principles of ventilation. We are not altogether disappointed. Here we have an inlet for pure warm air and an outlet for impure air. But here again the good intentions of the architect were more than offset by his lack of knowledge. The outlet and inlet are both on the floor level and within four feet of each other. The inlet has a sectional area of 254 square inches and the outlet a sectional area of about 75 square inches.

When it is remembered that there should be for each pupil an allowance of about twenty square inches in the sectional area of both inlet and outlet, the inadequacy of an outlet of seventy-five square inches, for a school of fifty pupils, is apparent. According to some measurements that I made to determine the velocity of the air at the inlet and also at the outlet, I find that through the large inlet there is a velocity of about two hundred feet per minute. Through the small outlet the air escapes with a velocity of one hundred and forty feet per minute. From this it would appear that much of the air must find another outlet besides that provided for it. It is well known that air, under very slight pressure, will escape through plaster, brick, or even stone. Through the large area of clean, new ceiling more than half the pure air that enters the room must escape. If this were any but the air that had just entered the room, the ceiling might well be accepted as a desirable part of the ventilating apparatus. On the contrary, the air that spreads itself over the whole area of the ceiling is that just fresh from the furnace.

DISCUSSION OF SCHOOL HYGIENE.

PROF. VICTOR C. VAUGHAN, M. D.

I hardly feel competent to speak upon this subject, which I believe is school hygiene. I am very sorry that I did not hear all of the paper, for I was very much pleased with the part which I heard. The subject of school hygiene is a very broad, interesting and important one. I must say in the beginning that I think that the people of Michigan as a whole have endeavored to have the best school-houses possible. I do not believe that any other State in the Union can boast of better school-houses. I am sure that the citizens of the State and the school boards have, as a rule, not been niggardly with their money. None of us who have constructed buildings, have at all times spent money most wisely, but it is not to be wondered at that much money has been wasted in the construction of school-houses, and much more might have been accomplished had we known more about the proper construction of school-houses. However, there are some interesting points to which I wish to call especial attention. In the first place, a great deal has been said about the location of school-houses. I think that this is of little importance. School-houses should be located, of course, in healthy places with proper surroundings. Much has been said about the height of school-houses; I think that a great deal of nonsense has been said about the injury to the health of our children by climbing stairs. I have been very much interested in reading papers about school-houses where in one paragraph the statement is made that students do not have enough exercise, and in another stair climbing is condemned. In possible case of fire, it is desirable that school-houses should not be more than two stories high, but I do hold that the condemnation of stair climbing is unfounded; I do not believe that any one boy or girl who is able to go to school at all is unable to climb the stairs if the climbing is done properly. What do we do when we climb stairs? We simply lift our bodies through the distance between the

lower and the next floor. What can be more beneficial if properly done? Why give ourselves hours of exercise and at the same time condemn stair climbing? There is no more beneficial exercise when properly carried out than stair climbing, either for boys or girls. Why, in Europe there is quite a plan or method of treatment in vogue, which consists altogether in mountain climbing. Of course, there is a difference between stair climbing and mountain climbing, because in the air we have the varied scenery to interest us and we have the pure atmosphere about us, and many things that we do not have in stair climbing. Still the exercise is substantially the same. The great danger in stair climbing is the way in which it is done. Watch the next young lady whom you see go upstairs, and in what position does she place her body? She doubles her body at an angle of forty-five degrees and strikes a trot at the bottom of the stairs, and when she reaches the top of the stairs her heart palpitates and she is out of breath. This is true not only of girls, but to a certain extent we are all in the habit of going upstairs in this way. Such exercise of course is harmful and cannot be otherwise. To go upstairs properly you walk erect, moving the legs from the knees as well from the hips, standing upright and walking upstairs; when you reach the top of the stairs you find yourself refreshed, your pulse about normal and your respiration but slightly accelerated.

Now, about ventilating school-houses there is one thing to which I wish to call your attention, which possibly was not brought out in the paper. We take air into the lungs and the oxygen of the air is taken into the blood and carried to the various tissues of the body. It is necessary that we should have good, pure air, the best that is obtainable. It is necessary that we fill our lungs with such air. It is necessary, in order to properly oxygenate the blood, that such air should be at our command at all times. However, when we have done this, we have done but half. Oxygen in our lungs can do us but little good until it is utilized. The oxygen in our blood can do us but little good until it is utilized. Where is this oxygen used? It is used up in the tissues of the body, it is used up in the bone and in the muscle and in the brain. And under what conditions can it be used? Only when there is a proper demand in these organs for the oxygen. We may have the best air to breathe, we may have our blood corpuscles laden with the purest oxygen, still, unless there be a demand in the lung tissues for that oxygen, it simply passes through the blood and that is all. It does not reach the physiological tissues of the man. I was called a month or two ago, professionally, to see a young lady who was stopping at Petoskey. Her folks had spared no expense in bringing her many hundreds of miles and had built there upon the shores of Lake Michigan a very nice cottage with a large veranda in front, where the cool, fresh breezes, as they came from the lake, would be swept about her; and every morning she was rolled out in an arm chair on the veranda to breathe in the pure air; and her parents were very much despondent after they had been there a month or six weeks to find no marked improvement, so they called in medical aid. As I sat there on the porch talking with that young lady, I was deeply impressed with the idea that people, as a rule, do not understand respiration. The girl had the purest air brought to her, still she was not gaining in strength at all. Her muscles were just as weak and flabby as when she left western New York, and what was the trouble? Simply this: there was no demand in her tissues for this oxygen which was brought to her in such great abundance. This demand can be created only

by exercise,—that is it,—only by exercising the muscles. The exercise in schools is one thing that is underrated (I mean physical exercise) more than anything else. The little students need gymnastic exercises every hour of the day to give them the very best of air, and they cannot utilize it unless there is a demand in their tissues for it. They cannot throw off the effete matters from the muscles unless there is exercise in the muscles, good, vigorous exercise. Let there be some drill or calisthenics which these little students have to go through two or three times a day, and the rule is, when this is done and these students are enabled to throw off the effete matter and fresh air can be brought in, that the exercise will enliven them, awaken every part of the body and they will return to their work with renewed energy and zeal.

Now, in the ventilation of school-houses, I think that the author of the paper has stated the facts as they should be. The principles of ventilation are, I think, perfectly explained and simple in these northern latitudes. We must bring fresh air in at or near the floor,—preferably in the base boards near the floor. Registers in the floor are too often made the depositories of filth of various kinds, little bits of matches and pieces of dirt from the feet are secreted down in the registers, while if it were placed in the base board just above the floor this could not be done. The air must be brought from without and must be warmed and brought into the room near the floor. I think there can be no difference of opinion about this; I think there is no difference of opinion among architects now upon this subject. Secondly, the foul air must be taken out near the floor. These are two well established principles. I am speaking now of Winter ventilation; of course, in the Summer, we can take the foul air out through the door, because the warm air does not cause any draught, and no doubt we can have a superabundance of it.

Now, we must not only have these arrangements for the bringing of hot air in near the floor and the taking of the foul air out, but we must have some means of creating a movement in these directions. In what way can we accomplish it? One is to bring the hot air into the room, but two objects cannot occupy the same space at the same time. The atmosphere that is in this room cannot be replaced until it is removed. We must either pull this air out of the room or we must push it out. I knew a lady a short time ago who moved into a very nice house that was recently built: the parlor had not been heated up to this time, and she wanted to heat it very quickly; she went in and pulled on the hot air register and cut off the foul air register,—closed it; it was to her disappointment when she found in an hour or two her room was not but very little warmer. She did not understand the principles of ventilation. She could not get the warm atmosphere into that room until she pulled or allowed the foul air to be pulled out. Ordinarily of these two methods of forcing the fresh air into the room or pulling the foul air out, the latter is cheaper, and I think ordinarily this is very efficient in large school buildings. In order to push fresh air into the room fans must be used; this necessitates an engine of some kind. If the foul air is taken out of the room, then it is only necessary to have the heated flue, or these flues may be heated by the smoke stack from the furnace, or, if steam is used, by opening the steam coils in the outlet flues. Now, the principles of ventilation have been discussed, and the only question that now arises is as to the amount of fresh air we get in, and of

course the amount and the rapidity with which we take out the foul air. Let your fresh air come in with sufficient volume. Let the registers be large enough (and your architect can tell you just how large they ought to be, and how rapidly the fresh air should come in, and the foul air go out), and there can be no question about ventilation.

There has been placed in many schools in Michigan, in the last few years, a system of ventilation which provides at the same time for the removal of excretions from the body. The foul air is thrown out into a chamber that is used as a receptacle for the excretions of the body and passes through this chamber out in the foul air escape. Now, I have simply this to say upon this point. It is not safe to have the dejections from the bodies of children or anyone else in the room occupied by the children. I care not how perfect may be your system of ventilation, there must always be, to a greater or less extent, a dangerous emanation, and windows must occasionally be opened, and in doing so there is always a possibility of some of the gases or the atmosphere which is sent out from this effete matter passing up into the school room. I am very sorry, indeed, that so many school boards have resorted to this mode of disposing of the waste substance from the body. It is a dangerous method. If you want to disseminate the germs of disease through the atmosphere, the very best means that you could take to do this would be to pass over the excreta dry heated air. As long as the germs are moist, they are always held there by the moisture; but when they are dried by the dry air they are carried in every direction that the air goes; if the air goes on out through the flue, they are carried up through the flue, and being particulate substances, they must setttle down where the atmosphere settles down. I have gone over this very hurriedly and I have no doubt there are many other interesting things to say in connection with school hygiene, but I will not take more of your time for the present.

Mr. Williams: I want to ask a question. I have listened to a part of the paper that has been read, and the discussion that has followed, and I apprehend that the principles as laid down apply very practically and are very satisfactory, where the hot air furnaces are used. As I understand it, the cool air or the pure air, should be let in near the floor, and the foul air should be let out near the floor. Now, I want to ask as to the method in the room we are now occupying. Here the air is brought in by hot water pipes passing around under the floor. I would like to inquire of the gentleman who has just spoken, where is the proper place for taking out the foul air?

Prof. Vaughan: Of course, where the air comes into the room cold, the rapidity with which it will come in will depend upon two or three things; first, upon the difference in the temperature between the outside and the inside of the church. Of course, the more pipes you have in the room, the greater difference there will be between the in-door and the out-door temperature, and of course, the greater the difference the more rapidly the air will come. Now, in such case as this it is not, I think, the best means of heating or ventilating at all, because the air should be brought into the room warm.

Mr. Williams: It is brought into the room warm. We have pipes running around the floor.

Prof. Vaughan: Oh, I supposed it was brought in cold. Well, the best place to take it and the only place to take it out would be near the floor. If it went out at the top, I think you would find it quite difficult to heat the room at all.

Dr. Henry B. Baker: I would like to suggest a point in this connection, for information. I do not see how it would be possible to ventilate a room and have it heated in the manner in which this room is heated. If anyone does see a way to accomplish it, I would like to have it stated. [The room was heated by hot pipes near the floor, around and throughout the room. No one present suggested a way whereby it could be properly ventilated, except by changing the mode of heating. But since the convention Mr. Wm. E. Williams has sent in the following:]

Mr. William E. Williams: Referring to discussion on subject of school hygiene as to the heating and ventilating of the church where the convention was held, I wish to be understood as saying: The heating is mainly accomplished by the use of a hot water system with a double pipe under each seat passing out from the wall and back again by bending like a letter v. Also supplemented by radiators composed of a large number of pipes bunched together and placed in some of the aisles and other convenient places. There is also a hot air furnace in the church which can be and sometimes is used. These pipes have water in them at all times and it is kept in motion when heated by the fire at the boiler or heater, and remains dormant when not heated. When the fires are started the hot water is carried to all parts of the room where the pipes run and by its contact with the pipes through which it runs causes *them* to become heated, and they in turn give off their heat to the *air* that surrounds them, and this heated (or warmed air, as it never gets very hot) rises till the whole room is warmed. By this method a very uniform temperature can be maintained, often varying only one or two degrees for hours together. "This system of course only utilizes the air it finds in the room." For purposes of ventilation fresh air is brought into the room through registers in the floor so arranged that drafts of air will not blow on the people in the room. We can warm the air for ventilation before it is brought into the room by an arrangement of pipes for that purpose, or can introduce it directly from out-doors, or use both means, and are governed in this considerably by the condition of the outside atmosphere. The foul air is drawn off through another opening. [At the top of the room, as explained further on.] This system of heating is certainly a very thorough and desirable one and more economical in point of fuel for the work accomplished than heating by hot air furnaces, and the effect upon the atmosphere in the room is much pleasanter and more comfortable than where *steam* pipes are used. This system can be controlled and operated with greater ease and efficiency and with more uniform results than steam or hot air. Our system of ventilation is very good, but I think can be improved somewhat.

The cold or fresh air is usually taken from out-doors, passing through a small room only; but can be taken from the basement, although it seldom or never is.

The foul air opening is about twenty square feet in size and is connected with a shaft or tower which has openings on all sides, and no matter which

way the wind blows there is a good draft or suction through the tower. This opening is a doorway, and is located well up toward the top of the room, and at the opposite end from the registers. You will probably, at first thought, claim this method to be wrong in principle. But I will endeavor to show that in the application of this method we are governed by the same principles that you are in heating your house by hot water, and the same as advocated by the others who took part in the discussion of this subject in the convention. To illustrate: When hot air directly from a furnace, or from any other means of heating (as hot water pipes in a box) is forced into a room, it will, on account of its less specific gravity than the colder air in the room, immediately rise to the top of the room. To make this fresh, warm air of any value to the people in the room, it must be brought down to their level. To do this the colder and foul air, which is of greater specific gravity, must be drawn off from the lower part through openings near the floor. When the fresh air that is brought into the room is about the temperature of the room, at the floor, or a little cooler, the fresh air will immediately seek the lower part of the room near the floor where the people are, and they will get the benefit directly, and where hot water pipes are scattered throughout all parts of the room near the floor, as is the case in this church, the fresh air is immediately warmed by coming in contact with these pipes, and as it rises, as it necessarily must, it affords warmth to the people and fresh air for breathing, and is then carried to the upper part of the room and off through the foul air opening. You will see the principle is the same as that employed in heating and ventilating with hot air furnaces, but the application is varied to suit the circumstances. The attraction of gravitation or specific gravity of the air governs the direction of its currents in every case. The advantage of this method, *in a church, especially*, is quite apparent. The ceiling in our church is about 34 feet high. When we used hot air furnaces oftentimes, by actual test, the thermometer would show 100° at the ceiling when it would only be 50° at a level with the top of the pews, and the floors would be cold to the feet, and oftentimes in very cold weather and a strong wind we could not warm the room sufficiently to use, and when we did succeed, it was at a great waste of fuel. Now, no matter what the weather is, we can make the room comfortable, and a test four feet from the floor and another at the ceiling will show a difference of only a few degrees, generally less than five, and the people, when they come in with cold feet, can go to their seats and warm them. And they certainly do sit much more comfortably with warm, fresh air all about them, than they ever did or could before.

Anyone who has had practical experience in heating a church knows that it is a very different thing from a dwelling or even offices and school-rooms where the rooms have very much lower ceilings, and the fires are kept up all the week through. I think, however, that every building, either public or private, that is to be heated and ventilated, should be constructed with a shaft that can be heated, and every room should have an opening into the shaft to draw the foul air from the room, and the location of that opening (whether near the ceiling or near the floor) must be determined by the method of heating and the course taken by the fresh air introduced into the room. If the fresh air comes in warm and rises to the top of the room, the foul air must be drawn off near the bottom, and this will likely be the case in the majority of rooms with the different methods of heating in vogue,

but where heating is accomplished as in our church, where pipes are placed all around the room near the floor and also at short intervals all over the floor and the fresh air is introduced as it is, then for the purpose of ventilation the foul air should be drawn off near the ceiling, for that is where it will be found, rising as it necessarily must all over the room from the exhalations of the audience and being carried up, and away, immediately by the warm currents ascending from the pipes.

Rev. D. C. Jacokes, D. D., of Pontiac: I have only a few words to say on this subject, which is one of supreme importance, and one I have been considering for the last fifty years. I have made a good many experiments, and I believe it is perfectly simple. First, you can heat and ventilate this room only on one principle. You must bring warm air into the room, and then you must take the air that is in the room out.

Now, this room is ventilated only as you open the windows on both sides. That should never be done. When you open the windows of a church at any time of the year, you should open the windows opposite the direction from which the wind comes.

You should not pass cold air through the room, for that threatens the health and the lives of the men and women that are subjected to it.

The experiments that have been made here today show that when you breathe air out you throw out very poisonous matter. It has been settled by the most careful investigation that each person vitiates three thousand cubic feet of air an hour; at least three thousand cubic feet of air is vitiated so that it is unhealthful to breathe. Now, when we breathe this air over and over again, we will breathe deadly poison. In my day, I have been very much interested in children, and I have known a great many infants to die from suffocation, because their parents would put them in bed between them, and cover their heads, until they were poisoned to death; and then wonder what was the matter. They died on account of breathing the poisonous air over and over again. When I was first stationed in this city, many years ago, the school board requested me to examine the schools very carefully, and report to them, which I did. I found that twelve persons in the schools were mentally injured,—some of the finest children that I ever knew,—just as the result of being poisoned.

Now, in order to ventilate school-houses, it is necessary to carry out the foul air through a heated flue. When the warm air comes into a room, it immediately rises to the top and floats on the colder air, somewhat as oil does on water; and then when you take the air out from the floor into a heated flue, then that warm air is sinking down, down, until it comes clear to the floor.

Some forty-five years ago I was stationed in the heart of the State where they had constructed a stone school-house; going there one cold day I found the house chilled; they had three stoves and they were all red hot, and the children in different parts of the house were chilly, and those that were near the stove were hot outside and chilled inside. I inquired about the people and I received an account of the death of a hundred persons who had caught cold, as they said, and died, while attending that church. The next day I preached a sermon on heating and ventilating that church. "Now," I said, "just give me one stove, and with the expense of about ten dollars, I will agree to heat this room,—every part of it—in sixty minutes." They accepted the offer; a jacket was put around the stove, and the room was

heated in just forty minutes. The catching cold ceased in that house entirely.

Not only is it important to have these school-houses and all our houses ventilated, but it costs but a mere nothing to do it, and it is exceedingly simple. When this new school house was built up here, the trustees might have put in a perfect system and it would have cost only twelve or fifteen dollars, but what did they do? They put up a very small flue for the stove, and a very much smaller one for ventilation, so that where the foul air goes out it is too small. It ought to have been just three times as large as it is. Yet, they closed it up at the top, leaving two hundred and ten inches of air to come in, then they have a pipe four inches in diameter, for fifty scholars to draw their breath from. We should not let this thing rest until this board of trustees see that that thing is changed. It is a cruelty to those who are sent there, and simply a torture. I spoke to one of the teachers about it, and she said: "I am obliged to open the windows and let the cold air come and sweep across the children. I must do it, or die."

As I say, ventilation is very simple, and if you want to ventilate this church, there is (in cold weather) but one way to do it,—let the air come in warm, and then carry out the foul air. First, let the warm air come into the room; secondly, carry out the air from the floor level through heated flues, then you can have fresh air, and you cannot have it without.

Fifth Session—Friday, October 18, at 7:30 P. M.

The Convention was called to order by the President. After a vocal selection by Mrs. J. H. Simonds, Miss Lillian Webster, Mr. E. J. Kelly and Mr. M. C. McKnight, the following paper on "Diphtheria, Scarlet Fever and other Dangerous Communicable Diseases," was read by John S. Caulkins, M. D.

DIPHTHERIA, SCARLET FEVER, AND OTHER DANGEROUS COMMUNICABLE DISEASES.

BY JOHN S. CAULKINS, M. D., THORNVILLE.

My subject is the restriction and prevention of diphtheria, scarlet fever and other dangerous communicable diseases, and with so extensive a theme my remarks must be condensed into the smallest possible limits. Among the "others" referred to, typhoid fever and epidemic dysentery are the only two that need to be considered, consumption being the subject of a special paper, Asiatic cholera and small-pox happily not prevalent, and measles, whooping-cough etc., seldom of a dangerous type, and very rarely fatal.

In the above mentioned four dangerous communicable diseases, we have no preventive measure analogous to vaccination in small-pox; their prevention is the result of their restriction, the only way to prevent them being to keep away from them and everything that has been in contact with them until it has been disinfected.

The two cardinal points of the compass on the chart that guides us in the restriction of these diseases are: (1.) Complete isolation of the sick. (2.)

Perfect disinfection of them and all their surroundings—room, furniture, bedding, attendants, and above all, physicians.

What there is to say on these two points will make the bulk of this paper, and something will be said on each subject.

The funguses which cause the "catching" diseases reproduce themselves sometimes by spores and sometimes by a process called "fission." When once the fungus of any disease or its spores get into the blood of a human being (or in some cases of the lower animals), the process of reproduction begins, goes on rapidly and soon makes him sick. The process is the same that is familiar to our eyes every day in different ways, in the rising of a pan of dough after putting baker's yeast into it, the yeast being a fungus, the brewing of a vat of beer made out of barley malt by putting brewer's yeast in it, or the working of apple, grape or other fruit juice into cider or wine in which case the fungus is in the downy substance on the fruit.

The best name for this process is "fermentation," and it is well enough to call the funguses that cause it "ferments;" you will see, then, that when we get the measles or any of these diseases, we are in the same condition as a barrel of cider that is working; we are fermenting.

It will be well to remark, first as explanatory, that the communicable, contagious, infectious or preventable diseases, as they are variously called (and some that are not commonly thought communicable yet), are caused by the growth in the blood of a fungus, each disease having a fungus of its own. I call it a fungus instead of using the scientific terms, bacterium, bacillus, or micrococcus or the indefinite word "germ," because it is a fungus like the toad-stool, which is, perhaps, the most typical idea of a fungus that you all have in your minds.* The seeds of every fungus are very small and they are numerous almost beyond computation. Take, for instance, the fungus we commonly call the "puffball:" the seeds are the smoke which comes out from it when it is squeezed, each little particle of which will grow a puffball if it should chance to fall where the conditions are favorable for its growth. The seeds of a fungus are called in botanical language "spores," and we will use that term. The nature of the process is this: the fungus being alive must have nourishment, and in getting it, changes the normal condition of the substance it is in, splitting it up, allowing some of it to escape in the form of gas, and some to remain in new forms in solution. The cider barrel is a good illustration†—alcohol remains in the cider and carbonic acid gas escapes. Heat favors fermentation. You have all noticed how much quicker cider works in hot weather. The blood, being hot and saline, is a very fermentable fluid. The fatal effects in the contagious diseases may be caused by the liquid poison left behind in the blood, analagous to the alcohol in the cider, or by the gas that is generated and cannot escape so easily from the blood vessels as it can from the cider barrel. I believe it is the gas that is the cause of death, at least in cases that die suddenly and early, seemingly overwhelmed by the violence of the attack. The gas, not being able to make its escape fast enough, kills suddenly, just as the gas from the cider rends the barrel if it cannot have vent. The gas from disease is liberated by the lungs, and the smell of it is sometimes a valuable means of diagnosis to me, each disease having its own smell. The smell of small-pox to my nos-

*I will use the word fungus because I believe I can make a sharper impression on your minds than I can by the use of the other terms. I will use funguses, too, for a plural instead of fungi.

†Other illustrations are decaying wood, where the gas liberated is carbonic oxide, a deadly poisonous gas; decaying meat, in which it is sulphuretted hydrogen.

trils is almost like that of rotting cucumbers, diphtheria like the smell of a barrel of corned beef that has begun to spoil, measles like musty hay and scarlet fever like a heap of long neglected dirty clothes. This means of diagnosis is not equally valuable for all. Some lack the power of differentiation of smells, just as some are color blind. It is in diphtheria that this means of diagnosis is the most valuable to me.

ISOLATION.

Put the sick into a well ventilated room, the larger the better, from which everything big or little, not actually wanted, has been removed. There must not be any carpet on the floor, curtains at the windows or paper on the walls, and the woodwork, including the floor, should be well painted and varnished. If there should be too much light for the comfort of the sick, papers can be pinned up at the windows to temper it, and the same can be laid on the floor should the noise from walking not be easily borne. Should there be paper on the walls or ceiling, it should be torn off and burned when disinfecting time comes.

The isolation must be complete, and to make it so observe these rules:

1. Allow none but attendants and physicians to come into the room.

2. Let the attendants, and family of the sick have no communication with outsiders, all necessary supplies being ordered through the physician and left in a convenient place where the isolated can get them.

3. Let no mail matter or any other thing be carried away from the house to go into the hands of outsiders, the only exception to this being, where the daily washing must be done away from the premises, in which case it must be disinfected before it is taken away by soaking two hours in a solution of zinc sulphate (white vitriol), four ounces to the gallon, or of mercury bichloride (corrosive sublimate), 60 grains to the gallon.

4. Nothing should be allowed to escape from the room that can blow away. Burn all combustible litter like paper, rags or straw from the beds, and thoroughly disinfect everything that can soak into the ground, especially the excretions of the sick, both from the bowels and kidneys. A good and cheap thing to do this with is a saturated solution of iron sulphate (common copperas).

5. The physician that has the care of a case of contagious disease must use all known precautions or he may himself be the means of carrying the contagion.*

So far as I am aware, no definite system of precautions for physicians to use to avoid carrying away contagion, has been recommended by any board of health; my own method of procedure is as below:

a. Before visiting a case of contagious disease, I am careful to cut short and clean up my finger nails;

b. I take a slicker with me to put on in place of my coats (over and under), leaving them in the wood-house or some other convenient outer room, where no one about the house can meddle with them;

* It must be owned that we are sometimes too careless. In an instance that came under my notice, a man, the father of two children sick with diphtheria of great malignancy, refused to be quarantined, telling his neighbors, some of whom were a little uneasy over it, that such nonsense would not go down with him, for the doctor came every day to see his children and then went directly to other houses, without using any precaution whatever, adding, consistently enough, that it was safe for him to do so, if it was for the doctor.

c. I have in the same room a jar of vitriol water and a dry mixture of sulphur, potassium chlorate and sugar to burn for a disinfectant;

d. I keep my hat on well jammed down over the eyes while in the sick room;

e. On leaving I wash the hands, face and back of the neck in the vitriol water, taking care to well moisten the whiskers, eyebrows and under the finger nails; if a thermometer has been used I wash that too;

f. After taking off the slicker and putting on the coats, I burn some of the mixture and stand awhile over the smoke, till boots, pants, vest and hat are well fumigated.

After using such precautions as these we can leave and go about our next business with a reasonable assurance that we are not carrying the seeds of disease with us, and with a sense of duty discharged that is very agreeable.

In scarlet fever and diphtheria it is not safe to deviate from the full rigor of these steps for isolating the sick, but milder measures might answer in typhoid fever and dysentery. Why? Because with them there is no proof that the breath of the sick contains the seeds of disease like the others, the evidence seeming to show that the poison is in the dejections from the bowels. This being the case, if strict cleanliness is observed, by plunging everything soiled into the disinfectant solution before drying loosens the germs of the disease and facilitates their escape into the atmosphere, the risk would be comparatively small that occasional inlookers could take any infection from the air of the room. Clearly, the case is very different where the poison of the disease escapes into the air with every breath the patient exhales, till it can be smelled as soon as you come near the bed, but, inasmuch as there is no absolute test of the sanitary condition, the right thing to do for those that are not needed, is to keep out of the room in all cases of contagious disease.

DISINFECTION.

The disinfecting methods which kept pace with the progress of the disease reach their climax when it is evident that the last case is over, with a general wash up and cleansing of everything that has had any connection with the sick room.

Having given hints for isolating the sick I will give my method of final disinfection:

a. Tear off and burn any paper on the walls and ceilings, if they are plaster whitewash them, if wood, wash them with the zinc solution.

b. If the floor is unpainted scrub it with hot copperas water, if painted treat it like the other woodwork.

c. Burn the straw in the bed and all old clothing worn by the attendants through the sickness. (It is a good plan for the attendants to put on some old suit, not worth saving and wear it, unless it gets soiled, until all is over.)

d. Then fumigate the room and all its contents, hanging everything up (clothing or bedding) separately and loosely, with burning sulphur, first making the room as tight as possible and leaving it closed until the next day.

e. After the room and its contents are well fumigated with the sulphur smoke, wash everything up and the job is completed except the personal disinfection of the convalescent, the nurses and attendants. See that they have and are instructed how to use some special disinfectant for the finger nails and the hair of the head, over and above the general disinfection.

There is a dangerous idea prevalent to a considerable extent that there is more than one sort of diphtheria. It has been common for me to hear the inquiry made in reference to a case of diphtheria, "Is it the *black* diphtheria?" As if there were a white form of the disease that was not so much to be dreaded. So of scarlet fever: it will, if of mild type, be called "scarlet rash" and thought to be a matter of small importance. This is a less dangerous error than the other, since scarlet fever of mild type generally runs mild to the end of the epidemic, while diphtheria will jump from one extreme to the other. *

We must work the best we know how, to disabuse the mind of the public of such errors as these and instill into it correct ideas of the nature of the communicable diseases. An ounce of prevention is worth a pound of cure. The State Board of Health has done much in this way, and much remains to be done, of which we can each do a little if we try.

It would seem that the public would be safer from the spread of a communicable disease if the whole charge of an outbreak were devolved on the health officer, and the Act No. 134, Laws of 1883, does apparently devolve it on him. According to that act, on receiving reliable notice of an outbreak of any communicable disease, he must investigate the facts in the case; order the prompt isolation of the sick or infected; see that the isolated do not suffer for want of nurses or supplies while shut up for the public good; give notice of infected places to the public by card on the premises, and otherwise if necessary; notify teachers to close their schools or to keep children at home from families having contagious diseases; and supervise funerals of those dead from diseases which endanger the public health.

The schedule of duties is definite and plain, and Sec. 2 of the law imposes a fine of $100 on whoever violates the orders of the health officer made in compliance therewith, but the law is seldom operative—only so when the health officer is called as the physician for the cases. The schedule of duties are his duties according to Sec. 1 of the law, only when he is not otherwise instructed by the board of health. If any other physician but the health officer is called, the board will invariably order him to take the charge of the whole matter and the health officer is released from all responsibility in the case. Theoretically, he is the health officer of the township, but practically, there are as many health officers as there are different physicians that have the care of the sick. In such cases what becomes of the punitory clause in Sec. 2? Is it still operative against violators of the orders of the physicians who are *pro tem.* health officers? The answer can hardly be in the affirmative, and therein lies a source of danger to the public. No doubt the local board of health could make the necessary orders and send them by the physician, but that would be awkward and inefficient. Too many bosses are bad—only one pilot on a ship at once, especially in a storm.

Why is it that an outbreak of small-pox is generally restricted to one case or at most to one family, while one of diphtheria or scarlet fever constantly reminds us of a fire in the woods in dry weather—breaking out in new places faster than we can put it out? There can be but one answer, it is for the lack of efficient, concentrated effort. When an enlightened community sees

* There is need of more work on the history of the fungus of diphtheria before this curious fact can be understood. We can suppose that some constitutions have greater powers of resistance than others, or that some render the poison more intense. We see something like it in the analogous process of making bread when the housekeeper's yeast fails to make her dough light; or in making sauerkraut the fermentation will sometimes be active and sometimes feeble. In such cases, there are conditions that are not understood.

in which direction its true interest and safety lies it will follow the path that leads in that direction, and insist that its health officer, who will be of course the most capable, experienced, energetic and conscientious that can be had, shall look (either personally, if possible, or by deputy of whom he approves) after every outbreak of preventable disease, through every step, isolation of the sick, quarantine of the suspected and disinfection of centers of contagion.

Eventually, we may believe that society will give its health officer the power to make a sanitary survey, when in his opinion the circumstances demand it, as when some unknown cause is operating continuously to cause an epidemic of communicable diseases, or to see, while an epidemic is prevailing, if any notoriously unsanitary conditions exist that facilitate its spread or render it more fatal if caught. Such a sanitary survey would include among its leading topics an examination into the water, ice, and milk supply (sometimes that of other articles of food), ventilation, condition of the cellar and outbuildings, drainage of the house and its surroundings, and whatever else may seem necessary to good and wholesome living.

It is undoubtedly a "far cry" to the time when anything so utopian as a sanitary survey will be known in the country districts, however urgent the need. This is not from want of jurisdiction. The powers of a township board of health (short of inflicting capital punishment) are as absolute as those of the Sultan of Turkey; the trouble is the power is not used, and will not be in the present state of public opinion relative to all preventable diseases, except small-pox. In an outbreak of that disease in country districts, the alarm is very great; it is an absolute panic. The public clamor loudly for the fullest use of the powers of the board of health to restrict its spread, and are willing to spend any amount of money for that purpose, so great is the fear it creates in a community. How different this is from what we see in an outbreak of diphtheria or scarlet fever. In an outbreak of one of these, instead of taking any such steps to restrict them as it would to restrict the spread of small-pox, the board does nothing in the case, except to send a physician to those too poor to pay their bills, and in other cases, to order whoever is called on by the friends to take the exclusive charge of the case, leaving the health officer entirely out of all connection whatever with the outbreak, which may come and go and he scarcely know of it. Sometimes the outcome is bad; the disease escapes from the house to which it ought to be restricted and starts up a new focus of infection. A case is slurred over because it is mild and thorough measures are not used. Folks hate to be shut up, and the good nature of the doctor blinds him and makes him too easily influenced to please his employers, and the public suffer for it.* It is different with a health officer—he is a sworn man—his oath obliges him to weigh well his responsibilities and be as thorough in isolating the mild cases, as he would the severest. By nothing short of this can he discharge his whole duty to the public of whose welfare he is the sentinel and guardian.

*A case apposite to this occurred in my own township. A family was said to have diphtheria—four or five cases all of mild type. One day I met a girl of the family on the street coming from a neighboring house. Said I to her, "I heard that you had diphtheria at your house." "Yes," she replied, "it is going through our whole family." Said I, "Why, then, are you going around, are you not afraid you will give it to some one?" Her answer was, "Oh no, the doctor says we cannot give it to anybody, it is so mild. It is not the catching diphtheria." I told her there was but one kind of diphtheria and that she ought to be at home. As soon as well enough, one of the children went to an uncle's in an adjoining town and gave the disease to her cousins, one of whom died with it.

If the law of 1883 has not as yet made, as far as perceptible, much difference in the old "go as you please" way of managing outbreaks of preventable diseases, it is no sign that it will not eventually and *soon* be perfectly adequate to effect everything for which it was intended. To the query: "How soon?" the answer is: not till the public fairly grasps the fact that diphtheria and scarlet fever may be restricted by the use of the same methods as in an outbreak of small-pox. Every community will then demand of its health officer, in loud and unmistakable tones, the vigorous discharge of the schedule of his duties enumerated in Sec. 1 of the Act of 1883 and hold him to a strict account if he neglects them. It will say to him: "We depend on you; look sharp after this outbreak; see that it does not slip through your fingers to invade our hearths, but dies where it began, like a fire that goes out for lack of fuel."

When the public has reached the stage of absolute conviction of these two points:

(1.) That every case of diphtheria and scarlet fever, like one of small-pox, is the result of some preceding case, and can originate in no other way; and

(2.) That it can be restricted and extinguished by the same methods that small-pox can.

Then Dr. Baker, if he lives long enough, will report differently from the comparative mortality of these diseases in the year 1887, diphtheria, 825, scarlet fever, 314, small-pox, 0.

I close by summing up my conclusions that to successfully restrict and prevent diphtheria and scarlet fever three things are essential:

(1.) Complete isolation;

(2.) Perfect disinfection;

(3.) A change in public sentiment that will demand both of these as completely in these diseases as in small-pox.

After thanking you for your attention, I close by remarking that I do not know why you should have had two sanitary conventions in this city, while there have been none held in Lapeer county, where I live; but, remembering the lesson of charity that was taught of old concerning the Galileans on whom the tower fell, I will not rashly conclude that you here in Pontiac are sinners above all men, although you have had the weight of two sanitary conventions fall on you; for I am painfully conscious that we have sins enough for which we must answer.

DISCUSSION OF WATER-SUPPLY.

BY PROF. VICTOR C. VAUGHAN, M. D., MEMBER OF THE STATE BOARD OF HEALTH, ANN ARBOR.

It is a well recognized fact now that a number of infectious diseases are generally spread by means of water. This is true of cholera, typhoid fever and dysentery. Cholera, we may omit from the list, because I think that with the sanitary vigilance that is now being exercised in the United States, in all probability cholera has visited this country for the last time, and I think that the time will soon come even in

Europe, when cholera, like the black plague, will be known only to history. But while we are not expecting an epidemic of cholera, we have constantly with us these other two diseases, which I believe are communicated very largely by means of the water-supply, typhoid fever and dysentery.

Let us give our attention, then, for a few moments to typhoid fever. There die in the United States every year on an average, thirty-five thousand people, or between that and forty thousand people, with typhoid fever. For every person who dies with this disease, at least ten are sick; so there are sick in the United States every year from this one disease, at least three hundred and fifty thousand people. For every person who is sick, the time and attention of at least one other person is demanded, either as a nurse or otherwise, then seven hundred thousand people in the United States each year are either suffering from or attending those who are suffering from typhoid fever. The average duration of the disease is about twenty-eight days. Now, if we calculate the time of the sick man and the attendant at fifty cents per day, you can readily see that it costs this country a large amount of money to maintain this disease. Let us get a little nearer home. There die in Michigan each year from typhoid fever, on an average, one thousand people; there are sick in this State each year, ten thousand people; there are sick, and engaged in nursing those sick with typhoid fever, twenty thousand people. Now, this is in face of the fact that typhoid fever is a disease which has no right to exist whatever. If every man should attend to the hygienic conditions of his own premises, if every one would follow the proper rules and regulations concerning disinfection, typhoid fever would, like the black plague, be known only to history. As this disease is communicated most easily by means of the water, I have selected it in speaking of the water-supply.

Now, of course, in getting water for a city, it is very important that you should take into consideration, first, the nature of the soil upon which your water is located. We may say, in brief, that there are three kinds of water used for drinking purposes. The rain water, or surface waters, as they may be called, and subterranean waters. Rain water coming from the roofs, into cisterns, is liable to contamination from the roof. Most cities depend upon surface waters. Now, they may be among the purest waters on earth, or they may be among the most impure. As I say, surface water depends upon the nature of the soil through which the water flows; and upon the rivers, lakes or other water courses in which the water is collected, and from which it is taken. Now, it would be very desirable indeed, if the pollution of our rivers and lakes could be stopped. It would be very desirable if we had some means of disposing of sewage, so that our rivers and lakes would not be contaminated, as they are. But, I want to make this talk just as practical as I can, and to apply it just as much as I can to the question of most interest to you, the water supply of Pontiac. What the nature of the well from which your water is taken is, you know better than I; what control you have over that water, or the possible source of contamination, you know better than I do. Are there any slaughter-houses or stock yards or pig pens, or anything of that kind situated near the bank of the stream? Are there privy vaults along its banks, either here or miles up the stream, where the excretion can be washed into this river? If so, your water-supply is not a safe one.

In making an analysis of the water, we determine first its chemical

impurities; we determine the amount of organic matter present, and we generally speak of the amount of free and albuminoid ammonia that is present in the water.

Now, bear in mind this: that a water may be impure, chemically, and not cause any disease; on the other hand, a water may be fairly pure, chemically, and still cause disease. However, a chemical analysis is worth a great deal in this way: these little organisms which cause typhoid fever are minute forms of vegetable life, they will not live a long time in water unless there be food and organic matter for them to feed upon. Now, when you are selecting your water-supply for Pontiac, take into consideration the surface over which the water runs, and the possibilities of contamination along its course; next see if there is in this water any organic material as food for these germs to grow upon. That is the next question. Now, the last question which we may ask, is this: Is the germ of typhoid fever present in that water? Probably not today, but it is liable to be there tomorrow. The surface is not free from contamination; there is a liability at any time for the excretions from patients with typhoid fever, up the stream, to get into it; if the water contained enough organic matter to furnish enough food for these germs to grow and thrive and multiply upon, then there is always a possibility of water contamination. These things are all to be taken into consideration, and I am sorry I do not know enough about the actual conditions existing here to speak to you more in detail concerning them. I shall be glad to answer, to the best of my ability, any questions that you may ask me.

Dr. J. W. Seeley: I would like to ask Professor Vaughan with regard to filters.

Prof. Vaughan: This about filters, in brief. Filters remove matters which are held in suspension. These matters, while they may irritate the intestinal canal, may set up some diarrhea, are not otherwise specially harmful. Filters will oxidize a certain amount of organic matter, so that there will be less organic matter in the water after filtration than before. Filters, so far as we know, will not remove the germs. A household filter is a bad thing; there is no question about that. Household filters, I think, as they are generally used, are to be condemned. They may make the water appear a little clearer, but you have, in the ordinary household filter, the most favorable conditions possible for the development of these germs. You are running your drinking water, with its organic matter, through this filter almost constantly; granting that the filter takes out a large amount of organic matter, it is held in the filter; these little microbes, vegetables, find a ready and suitable field for their growth in the filters. In fact the cultures we use, and in which we grow these germs, are very similar to a filter. Place a household filter in the kitchen or dining room, where it is generally kept, and I say, without any hesitation, it is a bad thing.

Now, about filtration on a large scale. Filtration through sand beds is relied upon a great deal more than the household filtration. It does, to a certain extent, purify the water,—not only the organic matter, but it removes a great many of the germs. However, it is not a complete method of removing the germs. The only sure way to kill germs that are present in water, is to boil the water. And, as I have said before, these little germs that cause disease are vegetable in their nature, and like all other vegetables, they are better taken cooked than raw. The surest way, then, is to boil the

water. I think that it would be better if all people did this, even when the water-supply is as good as it possibly can be; because there is always a liability of the contamination of the water-supply. For an illustration: there is a little village, Plymouth, Pennsylvania, of some six or seven thousand families maintained by a water-supply from the mountain stream, supposed to be as pure as any water in America. This water was collected in a reservoir and distributed over the town. The people rejoiced in the purity of their water-supply. But what happened? A man came from Philadelphia sick with typhoid fever, and through carelessness his dejections were thrown, without disinfection, on the snow upon the banks of the little mountain stream from which the water-supply was derived; the melting snows carried the germs directly into the stream, and the result was some twelve hundred cases of typhoid fever.

THE RESTRICTION OF COMMUNICABLE DISEASES.

BY A. ARNOLD CLARK, LANSING, MICH.

I have just about twenty minutes before I take the train, and I will give ten of them to you. Last September, in a certain city in this State, there was a boy who was taken sick with a certain disease, and he went to school for three days after he was taken sick; at that time a physician was called, who diagnosed the disease as scarlet fever, and the boy was at once isolated. But, during the time he was in school, there was nothing to excite the suspicion of the scholars who sat with him. Seven scholars and the teacher were taken sick with scarlet fever. They were so isolated from the members of their families, that no other cases occurred; and, although there were two deaths in one family, there was no other case where the disease was allowed to spread from one child to another. That was because these cases were so thoroughly isolated that there was no way of communicating the disease. This is the way scarlet fever is restricted in the city of Pontiac by your active health officer, Dr. Gray. But how might the entire outbreak have been prevented? On investigation, it was ascertained that this boy lived in a house where a year before another family had scarlet fever. If, the year before, that house had been thoroughly fumigated with the fumes of burning sulphur, this outbreak might have been prevented. What! You ask, is it possible that the germs of scarlet fever will linger in a house a year?

I will tell you another story. In the village of Laingsburg, in this State, in 1874, a little girl was sick with scarlet fever, and the doll with which she played was put into the garret with other rubbish; six years afterwards another family moved into that house, cleaned out the garret and burned most of the rubbish, but the doll with which this little girl had played was given to another little girl, pictures were given to two boys, and in ten days all three children were sick with scarlet fever. Now, if in 1874 the rubbish had been thoroughly disinfected with fumes of burning sulphur, these three cases would have been prevented, because the fumes of the burning sulphur will destroy these germs of scarlet fever. Look through the Reports of the State Board of Health and you will see that thousands of lives have been saved in this State by health officers who isolated patients

and then disinfected the houses with burning sulphur after death or recovery. Now, sulphur has always been a good orthodox disinfectant for the next world, and we now know it destroys these little devils in this world. That is what they are. You know it was an old idea that disease was caused by the possession of devils, and that the way to cure disease was to cast these evil spirits out. Our forefathers used to prick the affected part in the hopes of thus letting the evil spirit out, in much the same way that the Indian medicine men now gather about a patient, one playing the tom tom to scare the devil out, another jumping on the patient's stomach to stamp the devil out. If the devil doesn't kill the patient the doctor usually does. Now these communicable diseases are caused by the possession of evil spirits—these germs which linger in our hair and clothing, which hide in the rubbish of our garrets,—these devils, but, strange as it may sound, devils that can't live where sulphur is burning.

The communicable diseases then are preventable diseases because we know just how to kill the germs that cause them. If as Byron says, "It is a solemn thing to see the human soul take wing, in any form, in any way," certainly it is a sad thought that one-third of all the deaths which occur in this State every year are from diseases that might be prevented. Not long ago in one of your neighboring towns there were six deaths from diphtheria in one family in one week, every one of which might have been prevented had every officer done his duty.

I could not go as far as Thomas Carlyle, who said that every sick man was a rascal, but I do believe that there would not be any deaths from communicable diseases if there was not some rascality or ignorance somewhere, and this rascality and ignorance rest with the whole people, a people who will spend thousands of dollars to maintain a vast standing army to protect us against foreign foes with whom we ought to be at peace, and fifty dollars to protect us against this army of disease germs, a people who will spend thousands of dollars to protect the lives of fishes and a hundred dollars to protect the lives of men, women and children, a people who will spend thousands of dollars to maintain fire departments to protect our property from fire and will give to the sanitary fire department a hundred dollars to protect the lives of the citizens of the State.

Now, there is nothing but a train of cars that will stop me, my friends.

Dr. I. M. Rhodes: I do not wish to differ with any of the speakers who have spoken here on the subject of communicable diseases. So far as they have spoken concerning the laws governing the isolation of these germs, they are all that could be expected, and all that could be done by the health officers or anyone else in Michigan, or the United States. I concede that. But these discussions have given the idea that the diseases are only preventable by isolation, etc. I believe in all that has been said, but I believe in beyond what has been said. To illustrate. Should you see a nest of vipers that were ready to hatch out, the State Board of Health, and these local boards would say, "Go to work, and build a fence around them, so they will not come near us, and when they hatch out, we will not be injured thereby." Now, what I mean to say is, that the fence has seldom been so tight but what the germs (the vipers, I am now calling them) would find their way through the fence. Now my idea is to put your foot on the vipers' nest and stop it. In other words, to bring it to a real point at issue, stop the formation of all the other germs in every living patient, and every dead one too.

Is that possible? It is my experience that every single germ can be killed in the patient, and there need not be a living germ pass from the patient. It is no secret of my own or anything of that kind; it is only the result of my experience, and I bring it before the State Board of Health so they may be cognizant of at least my experience in the matter,—which is that these diseases may be aborted. I believe the day is not far in the future when, with the aid of these hygienic and sanitary measures that the State Board of Health is impressing upon the people, this treatment will be of the utmost value. Now, the community, as well as the doctors, may ask, "What is this wonderful treatment?" You have heard it spoken of last night in the paper, and also today, the mercurial treatment, used as an external application, bi-chloride, they call it. I do not give the bi-chloride internally, because it would be dangerous to the patient. If the diseases are thus treated I think it will be true that in a short time, with the aid of the rules and regulations of the State Board of Health, we will see an advance greater than there has been in the past; and I think the time is not far off when we will see comparatively the end of these diseases in the world.

Prof. Vaughan: Before going, I would like to ask the gentleman one question, and I do so merely for information, because what he states, if it becomes the experience of us all, will become very valuable. I would like to know how many cases of scarlet fever he has treated in this way.

Dr. Rhodes: I will say in answer to that that I have had this line of treatment for at least twelve or fourteen years, and I have been enabled to destroy the case in its infancy by this treatment; but I am not prepared to say that all my cases were contagious. We have no scarlet fever at the mine I am engaged at, now, neither is there diphtheria; although we have had a good deal of experience in the past, but I believe the germs are all gone from that particular locality. About two months ago, a father took his little boy, seven or eight years of age, to attend the funeral of another little boy, a cousin of his, who died of scarlet fever. Well, in a week or ten days I was called to see this little boy and I found his case to be well marked case of scarlet fever; there was no rash, but the throat was red, feverish and a little delirium, and altogether it looked like a severe case of scarlet fever. They were enjoined to remove everything out of the room, etc. I told them I would call the next day and see about it; the next morning I called, and found no rash (I did not know then that he had been away anywhere to be exposed to scarlet fever). The next day, when I called, the fever was nearly all gone, the throat looked better, and then they told me the history of the case—that the boy had been to a neighboring mine to assist in the burying of his cousin—and I could see that it really was a case of scarlet fever. That child had been threatened with it. Well, I said to them: "Watch this case closely, and if you find the least rash let me know." Five or six children lived right in the same family, and not another symptom of scarlet fever. That it was scarlet fever that the first child had, and died with, is rather proved by the fact that in two weeks from the death of the first child, they followed the second child to the grave with scarlet fever. Now, if you ask me what my experience has been, I would say that it dates back twelve or fifteen years, and the point is pretty clear in my mind that during the two years I have treated typhoid fever on this abortive plan, I have had no trouble, and the average duration of typhoid fever in my patients has been about four days. I think the disease can be aborted in that time. I

came here for the purpose of stating these facts to the Board of Health and laying the matter before them. I have already laid it before our district medical society of Lake Superior, and I can say that I am not alone in the use of this abortive treatment for all of these diseases.

HOW MUCH SHOULD PONTIAC PAY ITS HEALTH OFFICER?

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING, MICH.

I presume that most persons in this audience have formed an idea as to how much Pontiac should pay its health officer, yet probably your opinions differ greatly as to what is the proper amount. Perhaps some would say it should be the smallest amount for which any physician would consent to occupy the position. I venture to suggest that that is a very short-sighted view to take of the subject. Because it has come to be well known that many of our most fatal diseases can be prevented, especially those diseases which cause the great majority of what we call premature deaths—those among children and among people in the prime of life. From facts collected in our own State we know that in those localities where there is a good and efficient health officer, and where the people intelligently coöperate with him for the restriction of dangerous communicable diseases, there are not more than one-fifth or one-fourth of the number of cases or deaths from such dangerous diseases as scarlet fever and diphtheria as there are in localities in which such methods of restriction and prevention are not carried out. Let us study this important fact until we fully understand it, because it means that three-fourths or four-fifths of all the sickness and deaths from those diseases can be prevented. It means that we know exactly how to prevent that large proportion of the sickness and of the deaths. Are you willing to permit a continuance of sickness and deaths from diseases that are known to be in great part preventable?

An important fact in this connection is that, although these diseases are preventable, their prevention cannot be accomplished except by the general coöperation of the people of the city,—it is essential that there shall be a prompt and efficient health officer, and then it is essential that the people generally shall intelligently and faithfully aid him in the good work. Three of these dangerous communicable diseases are now present in Pontiac, and they cannot be restricted except the people of Pontiac will thoroughly coöperate with the health officer for their restriction. For the best work for the restriction of disease, it is essential that the health department of the city shall be so organized that it can act at a moment's notice,—its action should be even more prompt than is the action of the fire department, because in the case of fire there is usually only *property* at risk, whereas in the case of dangerous communicable disease it is *a question of life or death*, and perhaps to many persons. In order that a health officer can always be thus prepared, and always act thus promptly, his whole time and thought and study must be given to the subject; it will not do to wait for

his action while he is attending to some lingering case; it will not do to have his thoughts and studies mostly given to the treatment of sickness; he should employ all his time in studying how to prevent sickness and in actual work for its prevention or restriction. How much is all of his time worth? It is worth rather more than the income of the most prominent and successful practicing physician in the city; because sanitary science is one of the highest and most important sciences, and requires abilities of a high order, and because this service of the people for the saving of their lives and health is the noblest service, and because it is greatly against public policy to permit any class of persons, even so high and noble a class as the medical profession, to have a money interest in having sickness prevail, greater than the money interest of any other class that health prevail. This last suggestion may perhaps be more clearly made by a few words of explanation: In the minds of most persons there is a feeling that the relations which the medical profession sustains to the people are not just what they should be, that in some way the doctor ought to have a money interest in getting and keeping his patients well, and not have his pay stop just as soon as they recover. Under present relations his interests are, in this respect, apparently, antagonistic to the interests of the people. This feeling has found expression in the stories, which are, possibly, ideal, about how much better such relations are in some far off country about which little is known. Before we knew so much about China we used to hear that in China the doctor was paid so long as the patron was well, and his pay stopped as soon as the patron was sick. I hope it is true. And Dr. Rhodes told us this afternoon that that method is in practice in the Upper Peninsula of our own State. But without dwelling more on this point, I want to urge the very great importance of making it for the money interest of at least one of the most intelligent and faithful physicians in the city that health shall prevail. The law requires that the city shall have a health officer "who shall be a well-educated physician." In such a city as Pontiac the law should require that his entire time shall be devoted to the work, because the highest interests in the city demand that this shall be done. Then, of course, he should be paid for his entire time.

From one standpoint, then, we have learned approximately how much Pontiac should pay its health officer—that is, we would know if we knew how much the most successful physician in the city can collect. The health officer should be paid just a little more, for reasons already stated, and for the additional reason that all official positions are more or less insecure, and no physician could afford to give up his profession to engage in work which, to some extent, might unfit him for it, and run the risk of losing the position in a year or in a few years. This suggests also the fact that each year he is health officer he is gaining knowledge especially useful to the people, therefore, a good health officer should be continued in office. We may say, then, that he should receive at least two thousand dollars per year.

HOW MUCH CAN THE CITY AFFORD TO PAY?

It seems to me that the city can afford to pay for health and life-saving service about as much as its people will save by having such a service; and I think we now have facts enough to prove that a very considerable saving

is possible. Let us examine the facts, first as to the losses, then as to how much can be saved.

The average death-rate in Michigan, when not specially influenced, is about seventeen per thousand inhabitants. Let us estimate the inhabitants of Pontiac at six thousand. Then from this time forward there would naturally be in this city 102 deaths per year, from all causes. As I have before suggested, some of those ordinary causes of deaths are preventable; that is to say three-fourths of the cases and of the deaths from certain diseases do not occur where first and subsequent cases are promptly isolated and all infected things are thoroughly disinfected. What proportion of the total deaths are from these preventable diseases? Consumption is much the most important disease, and causes nearly twelve per cent of all deaths in Michigan, but for my present purposes I am not going to consider it. The usual proportion of the deaths attributable to three other diseases known to be preventable are as follows: diphtheria, 6.5 per cent; scarlet fever, 2.7 per cent; and typhoid fever 3.2 per cent of all deaths.* At this rate, in the six thousand people which are to be in Pontiac, there would ordinarily be in a year, on the average, about seven deaths from diphtheria, about three from scarlet fever, and three from typhoid fever.†

Reliable statistics, collected by the Michigan State Board of Health, have proved that (even after the disease is introduced) about seventy-five or

**The number of reported deaths, from all causes, in Michigan during the thirteen years, 1874–86; also the number of reported deaths from Consumption, Diphtheria, Scarlet Fever and Typhoid Fever, during the same period, and what the per cent of deaths from each, and from all of these four diseases is of the deaths from all causes.*

[Compiled from Registration Reports of Michigan.]

All Deaths.	Sum of Deaths from the four Diseases.	Consumption.	Diphtheria.	Scarlet Fever.	Typhoid Fever.
198,718	48,253	23,496	12,948	5,423	6,386
Per cent.....	24.3	11.8	6.5	2.7	3.2

By the above it will be seen that 3.2 per cent of all the deaths have been from typhoid fever, 2.7 per cent from scarlet fever, 6.5 per cent from diphtheria, and 11.8 per cent from consumption; and that 24.3 per cent of all the deaths have been from these four diseases, which are now believed to be in great part preventable by measures which are practicable by intelligent people in connection with the services of an intelligent and efficient local health officer coöperating with a State Board of Health.

†Estimated saving of life which might be accomplished in Pontiac, Mich., from the three diseases, Diphtheria, Scarlet Fever and Typhoid Fever.

Diseases.	Per cent of Deaths in Michigan per annum from each of the three Diseases.	Deaths in Pontiac per annum from each of the three Diseases.	Deaths in Pontiac which might be saved each year from each of these three Diseases, at the rate of seventy-five per cent.
Diphtheria.....	6.5	6.63	4.98
Scarlet Fever.....	2.7	2.75	2.06
Typhoid Fever.....	3.2	3.26	2.45

eighty per cent of the deaths from diphtheria and from scarlet fever are prevented by thorough isolation of all infected persons, and the thorough disinfection of infected persons, things, and places, therefore the thorough enforcement of these measures, will save, in each year, in this city, or at least in the average city the size of Pontiac, about five persons from death by diphtheria, about two persons from death by scarlet fever, and I think also, two persons from death by typhoid fever. Surely the saving of these lives is well worthy the effort of your people. It cannot with certainty be done except by general and organized coöperation among you. In other words, you cannot do it without an efficient health officer; and then you must aid him to the extent required by the laws of the State. If, however, you maintain an efficient health officer, and otherwise comply with the laws, and act in accordance with the recommendations of the State Board of Health, you can certainly save these lives.

If you really desire to do it, the plans of procedure are all worked out, and most of them are embodied in State laws. The measures applicable to each of these diseases are carefully explained in the several pamphlets which the State Board of Health has issued, and which are distributed in this audience. Some of you are already familiar with these methods, and I hope that all of you will soon become familiar with them, and that there will be such a thorough support of your health officer, and such a strong public opinion as will hold him steadfastly to his duties, and such as will pay him so well for his services that he can afford to do his best for the prevention of disease, leaving to other physicians the care for those already sick.

Of course I believe that lives can be saved from other diseases than those which I have just mentioned; but I have mentioned diphtheria and scarlet fever because in those diseases we have the absolute proof that lives can be saved by measures that are well known to us, and which can be summarized in three words—"isolation and disinfection."

What is the value of the lives which may be saved? When lives of young persons are lost to a community something else is lost, namely, their prospective earnings,—the wealth which otherwise they would have created. There are several ways of estimating this loss. As mentioned by the Governor last evening, a few years ago a good negro slave was valued, for what he would earn in excess of his keeping, at about eight hundred dollars; and statisticians usually value a person in the prime of life as worth to the community about one thousand dollars.

Children are worth as much less as it will cost to raise them to the most productive age. But if the seven children, which in the average place the size of Pontiac should be saved each year from diphtheria and scarlet fever, are worth only half the price of a grown person, there is a saving of three thousand five hundred dollars a year from these two diseases alone. If two lives are saved each year from typhoid fever, by disinfection of infected matters wherever there is a case, and by other methods which a good health officer could teach, the persons saved will ordinarily be in the prime of life, and this saving should be counted as two thousand dollars. There is, then, "in sight," as it were, a saving of five thousand five hundred dollars a year in Pontiac by such work as can be done by and in connection with an efficient health officer, with reference to three of the dangerous communicable diseases. Or, to put the subject in another light, if this city were to expend

five thousand five hundred dollars a year in the exact way in which I have indicated, it would not lose money thereby,—it would only be paying, to the health officer and a few others, as much as without such payments, is, as I believe, actually lost to the people of Pontiac. Is it not better to pay money for public-health services than to bury that of as much money value in the graveyard?

We will admit, if you please, that when deaths occur, the loss is not equally distributed among the people of the city; generally the loss falls most heavily upon the bereaved family; and this is especially true if the death is of the bread-winner of the family. But it should not require much argument to show that the prosperity of a city depends greatly upon its healthfulness and the safety of life therein, and that, in a long series of years, the deaths are distributed somewhat equally among the people, and that, even if they were not equally distributed, a high moral sentiment should prompt us to guard the common safety of life among us. It was recognized even before the Declaration of Independence, that to each citizen the right to exist,—the life of the individual is among the inalienable rights to secure which "governments are instituted among men." It is plain, therefore, that one of the highest, perhaps the very highest function of a government is to guard the lives of the people.

Having reference, then, to only three of the most important diseases, it seems plain to me that a city the size of Pontiac has the undoubted right to expend in every year five thousand five hundred dollars for the restriction and prevention of diphtheria, scarlet fever and typhoid fever. I think that there is good reason to believe that the citizens of Pontiac would make money by this work; because they would incidentally save lives and cases of sickness from other diseases than those I have mentioned; and, besides, in my account of the losses by those three diseases, I accounted only for the losses by reason of the deaths, leaving out of the account all the great expenses for the sickness. For instance, from the two diseases, diphtheria and scarlet fever alone, an efficient health service, properly supported, should in each year, save all the expenses incident to forty-three cases of dangerous sickness.* All such saving would be clear profit, in case the city expend the five thousand five hundred dollars per year, as previously suggested, and save five thousand five hundred dollars worth of lives, as I have shown may reasonably be expected.

We have seen, then, that the health officer should receive at least two thousand dollars a year; and we have now learned that the city can well afford to pay for sanitary purposes connected with three diseases, at least five thousand five hundred dollars per year. Of the three thousand five hundred dollars per year, left after paying the health officer, I would advise that at least one thousand dollars per year should be expended toward securing a water-supply which is above suspicion. This with special reference to the prevention of typhoid fever. I would use another thousand per year toward securing good sewerage, and a proper disposal of waste. The remaining five hundred dollars would pay for disinfectants, for printing annual and

*The reports compiled by the Michigan State Board of Health show that for each death from scarlet fever, there are over ten cases of sickness from that disease; that for each death from diphtheria there are four cases of sickness from diphtheria. Therefore the seven deaths on an average yearly from diphtheria in the average place the size of Pontiac, should represent twenty-eight cases of sickness, and the three deaths from scarlet fever represent thirty cases of scarlet fever,—58 cases from the two diseases; and, inasmuch as seventy-five per cent of them should be prevented by an efficient health service, forty-three of the cases should not occur.

other reports of sanitary officials, including the water and sewerage commissioners; and for other incidental expenses.

The city of Detroit pays its health officer three thousand dollars per year, and employs and pays for the services of clerks and sanitary police officers. But as a rule the cities in Michigan do not seem to have awakened to the importance of the subject. Communities have grown to be villages and villages into cities so gradually that the dangers which come to people because of their close aggregation have not attracted the attention to which their importance should entitle them. The health officers themselves know very well that they are not doing, and, as they are now paid, cannot afford to do what should be done to protect the lives and health of the people under their care. Although the health officers say little about it in their respective localities, it is not difficult for us at Lansing to learn how they feel about their compensation, and why they do not do what they know should be done. The following letter illustrates how some of them really feel:

"————————, *Oct. 14, 1889.*

"Secretary, State Board of Health, Lansing, Mich.

"ESTEEMED SIR:—Yours of the twelfth inst. at hand. Fully realizing my duties as health officer, first to the individual families, second to the community, and third to the State, how can I be expected to do all I should? The duties to the State require considerable clerical work and other attention which I do neglect, and why? Simply because since March 4th, 1889, I have done for the village what a private person would be obliged to pay about $128.00 for, and have shirked all I could then, and perform my duties to family and community and totally neglect my duties to your office, because I receive from this village of 3,500 inhabitants $75 per year. Do you blame me?"

[Signed] "————————, M. D.,
Health officer."

This health officer admits that he has "shirked all he could" and yet has earned about three times as much as his salary. It is easy to preach to such an officer that he has taken a solemn official oath to perform the duties of his office according to the best of his ability, and that if he will not do that he ought to resign; but probably he knows that public opinion does not require more of him than he performs, that if he did all that he knows should be done it would require all of his time, and that for all of his time he can earn in the treatment of the sick at least one thousand, and perhaps two thousand dollars per year.

There is a law of supply and demand. The people demand and pay for their treatment when sick. They do *not* yet demand that much of the sickness shall be prevented. In Pontiac you support a number of good physicians in active practice, any one of whom would probably just as willingly serve you in the prevention of disease as in treating disease, and if paid for such service, the best one among them would soon learn to prevent as many cases as he now treats. Then how much more satisfactory that would be to all concerned!

I am a strong believer in the doctrine of conservation of energy—and that no worthy effort is wasted. I believe that good has resulted in Pontiac from the sanitary convention held here in 1883. For a time after that, there was a sanitary association here. That is a good thing for any city. But to make such an association of the greatest usefulness there must be connected

with it persons who have a money interest in sanitary work. It will not do to permit the heavy burden of it to be borne by a few persons who have no greater pecuniary interest than all other citizens of the place. Sanitary work is for the general good of all, and all should contribute to its support. The only way in which this is practicable is through a system of taxation in the most equitable way. In other words the money to carry out the sanitary work, which your local association shall decide is necessary, should come out of the general fund of your city, or a fund similar to the one which pays for fire-protection purposes. In some cities, a public meeting is called each year to decide how much money shall be raised for school purposes; and the amount voted is raised by taxation. I would recommend that a public meeting be called here annually to decide how much money shall be raised for health and life-protective purposes, and that at such meeting the subject of this paper be *one* of the topics discussed.

I sincerely hope that this convention will put new life into your local sanitary association, or cause a new association to be formed; that it will cause a public meeting in the interest of sanitary progress; that you will decide to pay your health officer such a salary as will compensate him for devoting his entire time to your service; that your city will enter more vigorously upon the work of preventing and restricting those diseases which we know so well how to restrict; and that the next time we visit Pontiac you will not have, as you now have here, three of the most dangerous of those diseases; in fact I look forward cheerfully and hopefully to the "good time coming" when sickness and premature deaths from preventable causes shall have ceased, and when the large sums of money heretofore wasted paying expenses for unnecessary sickness and funerals, and the large sums of money which shall be earned by persons whose lives have been saved through sanitary work, shall be available not only for paying for the *constant* services of Doctor Gray or some other advanced sanitarian as your health officer, and for such other sanitary improvements as an improved water-supply and a good sewerage system, but also for various other purposes which shall minister to the well-being, comfort and happiness of all of your people.

RESOLUTIONS, CLOSING OF THE CONVENTION.

The following resolution was offered and adopted:

"*Resolved*, That a vote of thanks be tendered to the State Board of Health and all those who have so ably assisted in making these meetings so pleasant, profitable and successful."

Dr. Baker: In behalf of the State Board of Health, I wish to express my high appreciation of the interest taken in this convention. We have had a good attendance throughout, and the people have listened patiently to those of us who have come here from abroad, and I wish, on behalf of our board at least to express our appreciation of your work, and hope that it will be continued.

On motion of Rev. D. C. Jacokes, a vote of thanks was tendered for the use of the Presbyterian church during the sessions of the convention.

A vote of thanks was also extended to those who had kindly rendered assistance in furnishing music.

CLOSING REMARKS BY THE PRESIDENT, HON. BYRON G. STOUT:

LADIES AND GENTLEMEN: Before this convention closes, I beg to give my thanks to the gentlemen who have participated in the discussions, for the courtesy which they have extended to me. It is sometimes a very difficult task to preside over deliberations of other bodies, but this has been indeed an easy one, and it has been made easy by that deference and kindness with which these questions have been discussed. I also thank the good people of Pontiac for the attention that they have given to the papers. Some of these papers contained some things of a technical character, and some technical terms which some of us may not have understood, but I wish to thank you, as I say, for the marked attention you have paid to the papers and the discussions. In closing, I may be permitted to thank you for the progress that is being made in everything in our age. Indeed, when I look back a little over the fifty years of my life, and see the progress that has been made, even in sanitary science, it seems amazing. What have we seen in that time? The railroad, the telegraph, the photograph, the electric light, tho telephone, and I might say a hundred other great improvements of which the world had never dreamed centuries ago. The same prominence has been given to medical science. I am satisfied that the result of these conventions will be important to us all. It will awaken a public interest. It will awaken a public interest in the subject that comes home to us, for there is no more important question to us than that of the health of our families and ourselves. You have evinced, by your attention here tonight and in the previous sessions, that you are awakened to the appreciation of the great importance of this topic. Again I congratulate you upon the result of this convention, and hope you will all go to your homes feeling satisfied with the labors of the past two days.

STATISTICAL ASSOCIATION

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

VICKSBURG, MICHIGAN,

DEC. 5 AND 6, 1889.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF VICKSBURG.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1889.]

[No. 314.]

SEAL.

BY AUTHORITY.

LANSING, MICH.:
DARIUS D. THORP, PRINTER AND BINDER.
1890.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

VICKSBURG, DEC. 5 AND 6, 1889.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH
FOR THE YEAR 1890.

[No. 314.]

Darius D. Thorp, State Printer and Binder, Lansing.

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statement of facts and opinions expressed therein.

VICKSBURG SANITARY CONVENTION

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT VICKSBURG, MICH.,

DECEMBER 5 AND 6, 1889.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1890.

This Convention was held, in compliance with an invitation from the citizens of Vicksburg, under the direction of a committee from the State Board of Health and a committee of citizens.

The following persons were the local committee: C. H. McKain, M. D., Chairman; F. S. Coller, M. D., Secretary; W. W. Scott, D. D. S.; Tyrrell Rayner, Jr.; Oscar B. Dunning; George Newton, M. D.; William Bair; S. C. Van Antwerp, M. D. The executive committee consisted of Dr. W. W. Scott, Dr. S. C. Van Antwerp and Tyrrell Rayner, Jr. The reception committee consisted of local physicians, Dr. George Newton, chairman. The committee on music consisted of Prof. W. E. Ransom, Mrs. Elsie Hill and Mrs. O. B. Dunning.

The committee from the State Board of Health consisted of Henry B. Baker, M. D., Lansing, Mich.

The officers of the Convention were:—President, Hon. James M. Neasmith, Vicksburg; Vice-Presidents, Davis T. Dell, Vicksburg, H. C. Clapp, M. D., Mendon, J. F. Chapin, M. D., Schoolcraft, George C. Pease, M. D., Fulton, George M. Braden, M. D., Scotts; Secretary, Charles H. McKain, M. D., Vicksburg.

Among those in attendance at the sessions of the convention were the following, not citizens of Vicksburg:

H. C. Clapp, M. D., Mendon, Hon. Edwin Stewart, M. D., Mendon, Prof. Dewey, Alpena, Prof. Delos Fall, Member of the State Board of Health, Albion, Prof. V. C. Vaughan, M. D., Member of the State Board of Health, Ann Arbor, Arthur Hazlewood, M. D., Member of the State Board of Health, Grand Rapids, Henry B. Baker, M. D., Secretary of the State Board of Health, Lansing, and A. Arnold Clark, Lansing.

First Session—Thursday, Dec. 5, at 2 P. M.

The Convention was called to order by the President. After prayer by Rev. A. C. Webster and music by Mrs. E. T. Trimmer, Miss McMaster, Miss Bertha Clement, Mr. Fred Robinson and Mr. Gideon Beebe, the President made the following remarks:

REMARKS BY THE PRESIDENT OF THE CONVENTION.

BY HON. JAMES M. NEASMITH, VICKSBURG.

(Reporter's Abstract.)

LADIES AND GENTLEMEN—I thank you for your attendance here today, you who reside in this village and you from abroad. Addresses of welcome must be very common to the members of the State Board of Health, considering the number of conventions which are held each year in the different parts of the State.

I believe that the questions to be discussed here will be of great importance to the citizens of Vicksburg if we abide by their conclusions. We are to have papers by our local physicians, and discussions by the members of the State Board of Health. These gentlemen have made a specialty of what will prevent disease and preserve health,—of sewerage and water-supply, of ventilation and of all those sanitary improvements and precautions which will prolong life.

Gentlemen of the State Board of Health, I welcome you as preservers of health, who are engaged in the cause of humanity. The State appreciates and is thankful for your services. Your reward will be the consciousness of duty done. I welcome you to our village hoping that you will carry away nothing but pleasant memories.

SEWERAGE AND DRAINAGE OF VICKSBURG.

BY C. H. MC KAIN, M. D.

The subject of sewerage and drainage, in all its bearings, is quite an extensive one and I do not expect to do more than point out some features of it which most interest us.

As to its history we find no reference to it except in modern times. We are told that the ancient city of Rome was supplied with water by twenty-eight or thirty aqueducts of various sizes, but no mention is made of the manner in which this large volume of water was carried off, so we are left to infer that surface drainage was the only method known to the ancient Romans.

It seems that in the middle ages no more was known of sewers, and much less water was used to wash away the waste, and in those low-lying cities where natural drainage was not good, people lived and fairly wallowed in filth. In the days of Queen Elizabeth the masses in London lived in houses, many of which had no floor, the ground being strewn with rushes and frequently renewed by putting fresh layers over those already there, that were saturated with dirt and filth. Slops of all kinds were thrown into the streets, accumulating in great abundance, poisoning the water and air all about.

As a consequence we are informed that the plague claimed thousands of victims annually in every city. In the year 1348, there perished in Florence

more than one hundred thousand persons from that dread pest. As late as the year 1665 another one hundred thousand died in London of the same disease.

In the early part of this century cholera swept over Europe and even reached our shores. In Scotland it carried off people by thousands and could not be checked until thorough and intelligent drainage and cleaning were undertaken. Now the cities are supplied with sewers and drainage is good, the plague has disappeared from Europe, and cholera does not claim a tithe of its original quota of victims.

There still remains much for sanitarians to do. Many vexing questions as to water and drainage are yet unanswered, and while the diseases that spread terror among our forefathers are being held in check, others are demanding much attention. Among those of a zymotic origin, typhoid fever ranks high. We are informed that ten thousand people are thus afflicted, and that one thousand die annually, from that fever, alone, in Michigan. It is the opinion of many sanitarians that typhoid can be nearly or quite driven from among us "if people will cease polluting the soil about their houses with slops, cesspools, vaults," and such well known sources of contamination, and see to it that the water they drink is not loaded with poisonous organic matter. Bad drainage, by which our drinking water is poisoned, is like an adder that stings in the dark.

As the subject of drainage and sewerage has received but slight attention from house-holders in this village, but little is known about it here. I frequently find an open pipe leading a few feet away to a bad cesspool, the pipe constantly returning to the kitchen foul and poisonous gases. In many other instances the slops are carried a little distance from the back door and thrown on the ground. A part is taken up by the soil and possibly enters the well. Much evaporates and the wind carries off the gases, which do not annoy the occupants of the house, or their neighbor, unless the wind drives the vapors towards the house. Such vapors, entering windows opened to admit pure air, may convey typhoid fever or diphtheria. While this is far better than to have an imperfect drain, connected by an open pipe with the kitchen sink, it is open to many serious objections, which have already been stated.

In the first place I shall endeavor to show how the waste from the kitchen can be conducted safely from the house without the return of odorous gases. By the use of what plumbers call traps, in otherwise well constructed drains, the most perfect method of disposing of kitchen slops is obtained. These are portions of tubes bent somewhat like the letter S, connecting with the sink above and the waste pipe below. You will readily see the principle of the trap. A part of the curved portion of pipe is constantly filled with water and prevents the return of gases from the main pipe and the cesspool, or place where the contents are finally deposited. There is some danger of the trap emptying itself like a syphon. When water ceases to come in from above, the column in the tube below may carry the whole over into the main pipe. To prevent this a small tube should be connected with the trap, for vent, and open as high as the eaves of the house, or into the chimney, to prevent the gases from entering the house by an open window or otherwise.

Once safely outside of the house it becomes a question as to what shall be done with this waste material. In cities, provided with a sewer system, it is only necessary to connect with a sewer pipe. In the country it should be

carried by pipes, under ground, one hundred, or one hundred and fifty feet from the house and well and enter a cesspool, either open or well ventilated. This whole pipe should be well cleansed with a saturated solution of sulphate of iron, at regular intervals, and all about it kept thoroughly clean.

In a village like Vicksburg, what are we to do? It is a question more difficult to answer, for in many cases one hundred feet from your own house and well will bring you into close proximity to your neighbor's house and well, as it is only sixty or seventy feet on most residence lots, from back door to boundary line. By reference to charts to be presented during tomorrow's meeting, you will see that it is impossible to get a well more than twenty-five feet from an old vault or cesspool, and in some instances the wells are located at even a less distance than that.

The subsoil here is of gravel and sand, overlaid with clay, or a "hard pan." Once through this layer of clay, it will soon pass some distance from the cesspool. Many are misled by the belief that by passing through a few feet of gravel or sand, very bad water is made pure. It has been repeatedly proved that after passing through one hundred feet of pure sand, water was still loaded with poisonous material. Nevertheless, sand and gravel do act as a filter to some degree, but they, like charcoal, will lose their filtering power in a few months. Soon they become polluted with the impurities they have taken from the water, and are then a source of danger to themselves.

When the source of contamination is ample, the impurities travel hundreds of feet through the ground, as experience has often proved. Gases also penetrate the soil, even to the distance of seventy-five or eighty feet, and may enter the cellar direct from a vault or cesspool (when too near the house), and rising up render every room in the house unfit for occupation. I believe this to be the cause of outbreaks of disease in many otherwise cleanly and well regulated houses. If so, it is only an additional incentive to be certain that all such possible sources of disease are removed to a safe distance from the house.

Can the conditions here in any way improve as time goes on? But one answer can be offered. At present we are exempt to a great degree from all infectious diseases. I hope this may continue for all time to come, but if we are to judge from the experience of others we know too well the contrary. The fact that we have been exempt from such diseases and that our village is now "a healthy one," as I have often heard remarked, affords us no protection against future outbreaks. It will not keep out typhoid fever or diphtheria. Once let the germs get into our wells and this will no longer be considered a healthy place.

It is the usual custom, in proceeding to the question of sewers, to wait until the people are driven to prompt action by the sacrifice of many valuable lives, and until the actual expense, in sickness and death, far exceeds that of an elaborate system of sewers, and then proceed hastily to construct that which requires much time and thought to put in successful operation. The result is imperfect work, expensively done, and disappointment in the end.

It is to be hoped that this village will act seasonably and begin to lay the first pipes that will go to make up that elaborate system of sewers required in places where many people are crowded together.

To speak here of the mode of construction of sewers, the capacity of pipe

necessary or the shape of the bottom of a sewer that will carry most rapidly, would not be within the province of such an article as this. Something of the amount of work done by a good system may be judged when we reflect that enough sewage is annually thrown on the ground, in New York, to fill every street in the city to the windows of the second story.

A system of sewers without a good water-supply, however, would be a useless burden. Many efforts have been made to secure water-works for protection from fire. While that is of great importance, protection to life is of far greater. With plenty of water at hand with which to flush sewers, one main line would do much work. The village is so located that the most of it could be sewered with ease. There is an abundance of water in the stream to carry to the lake all that will be delivered on its banks for many years to come. It would be easy to reach the stream below the village so that there would be no possible contamination of the water-supply thereby. Certain it is that in the older portions of the village some other method will be demanded for disposing of waste than that now in use, and at no distant day.

Concerning the surface drainage of Vicksburg, it is generally good. The subsoil of clay prevents the ground from taking up the surface water, and there is sufficient slope to carry it off. Much of it enters this large tract of marsh in the midst of the village; since that has been drained, it finds its way to the stream, in time. It is to be feared, however, that the drain will not be equal to the demands made on it in a rainy season. It should not only carry it off, but it should do so in a short time, as it will be unhealthy to have the marsh covered with water for any length of time. The portion of mill pond on the west side, below the railroad bridge, is a constant menace to the health of those living near it. It seems to me that steps should be taken looking to the final draining of it below the above mentioned bridge. It is neither useful nor ornamental.

Aside from draining the marsh and laying stone gutters on Main and Prairie streets, no money has been expended in draining the village. Sewers can be made to carry off the surface water, as well as sewage, and in that way might be useful even without a general water-supply.

DISCUSSION OF SEWERAGE.

BY A. ARNOLD CLARK, LANSING, MICH.

When I bought my ticket from Lansing to Vicksburg, I dropped a nickel in the slot and obtained another ticket which I hold in my hand, and this ticket informs me that if I had lost my life by an accident on the Grand Trunk Railroad a certain amount of money would have been paid to my relatives. Why? Because it is universally admitted that every man has a money value to the community and to his family. There is a statute in most of the States providing damages for the taking of human life. The minimum amount of damages which can be recovered in Connecticut for the wrongful taking of a human life, either by negligence or feloniously, is

fixed by statute at $1,000. The maximum amount is $5,000. The maximum is fixed in most States at $5,000. In California, a child seven years old was run over by an engine and killed; $5,000 in damages were awarded. The ground for recovery in every case must not be injured feelings, or mental suffering, but an actual pecuniary loss, and is based upon the reasonable expectation of what such a man would earn for his family had he lived. Now, whether we consider man as the law considers him, whether we sit down with a life table in our hands, as did William Farr, and calculate the future annual earnings of a man at a given age, then subtract his future cost of living, and take the capitalized remainder as the value of the man to the community, whether we say, as some have said, that each man is worth to the community, just what it will take to reproduce, to train up from infancy, another man just like him, or whether we remember, in a simple, common sense sort of a way, that a few years ago, men were actually sold by their fellowmen, and that in the slave markets of the south the average value of a man was $1,000,—every life is a money blessing to the world, every death tends to bankrupt the nation, and sickness in a community is a financial panic.

The speaker has told you of the relation of sewerage to the death-rate from typhoid fever, and it is true that the death-rate from typhoid fever in London today is only one-fifth what it was in 1860 when London introduced its present sewerage system. There are a thousand deaths from typhoid fever in Michigan every year, mostly of those in the prime of life. For every death there are ten cases of sickness, and when we think of the cost of nurses and medical attendance, when we think of the loss of wages, and above all of the value of those lives to the community, we see that it pays to spend money for sewerage and other sanitary measures which save human life.

To be sure, sewerage and water-supply will add something to your taxes, but Vicksburg would be a safer place to live in. Your taxes would be lighter if every man were his own policeman, but it would not be so safe. So the complete removal of all waste is as much the function of the whole village as the employment of a police force—or as the lighting of the streets.

It needs no discussion, it admits of none, the privy vaults of Vicksburg, which are likely at any moment to receive the dejections of some typhoid fever patient and to carry the germs of that disease by these underground currents to some neighbor's well,—the privy vaults of Vicksburg are so many relics of barbarism, and your local board of health has it in its power to declare them nuisances and order them abated.

What shall take their place? Tomorrow we will discuss the dry-earth closet method of disposing of waste, and other temporary expedients, but I trust that within the next ten years Vicksburg will have a system of sewerage and water-supply. Before you can have a good sewerage system you must have a water-supply. A proper sewerage system should carry off only that waste represented by the water-supply. The old fashioned sewers were flushed by the rainfall and it was necessary that they be large enough to accommodate the heaviest rainfall. You remember Victor Hugo's description of the sewers of Paris which were so large that Jean Valjean was able to pass through them upright with Marius on his back. The sewers of Rome were large enough for the Roman emperor to row a boat through them. In dry times the sewage flowing over so large a surface flowed very slowly.

This furnished a good opportunity for the formation of sewer gas, and sometimes this sewer gas went the wrong way.

The damp walls of these drains became a good nidus for the microscopic germs of disease which also flowed back into the houses with the sewer gas.

The proper system for you to adopt is such a system as, ten years ago, Col. Waring recommended to the citizens of Memphis,—which has come to be known as the separate system of sewerage. Its object is to remove by the sewers nothing but the sewage and to remove the storm-water by a separate drain, or by natural drainage.

The citizens of Memphis were taught the necessity of a proper sewerage system by a great epidemic of yellow fever which cost that city in ten weeks five thousand lives. But that epidemic was just what the citizens of Memphis needed. Memphis was one of the dirtiest cities on the globe. At once the people of Memphis cleaned out their five thousand cesspools, put in these small sewers recommended by Col. Waring,—ranging in size from 6 to 15 inches (with a main outlet sewer of 20 inches), with automatic flushing tanks filled every twenty-four hours and then discharging 150 gallons in less than a minute, with ventilating pipes running to the tops of the houses. No stoppages have occurred in the eight-inch sewers. The sewers run so nearly full that there is no chance for germs to grow on the walls or for sewer gas to form, the whole underground network moves with the regularity of clockwork, and since the introduction of this system the death-rate in Memphis has fallen off one-fifth.

If every human life is worth something to the State it paid the city of Memphis to spend a little money to introduce this sewerage system.

With the introduction of good sewerage and water-supply, the death-rate of cities and nations has everywhere steadily decreased.

The essayist has told you how they lived in the dark ages—that age of dirt—and he has spoken of those great plagues, which nearly depopulated the nations of the earth. At the time of the black death the farm houses of Europe consisted of one room built of stone—no mortar, no window, no chimney, no pillows, no bed, no floor. The filth was left to accumulate on the ground where the inhabitants slept. When this filth became unbearable it was covered with a layer of rushes, and then with other layers. In the large cities it was not safe to pass along the streets at night for fear of being deluged by slops from the windows. It is said that the streets were often so narrow that people could shake hands from the windows of houses on opposite sides of the street. And when the black death swept over England only one in ten was left alive.

Even in the sevententh century the average man only hoped to live to be twenty-four years old. Now he may live to be fifty, while scientists tell us that if we lived as we ought to live, that if we prevented those diseases which we now know enough to prevent, the average man should live to be one hundred years old.

Prof. Huxley says that that time is coming,—the time is coming when a friend meeting another in the street will as soon ask are you honest as are you well,—when a man will be as ashamed to be told that he looks sick as to be told that he he looks like a thief, and the object of this Convention is to help bring about that time.

Dr. Henry B. Baker, Secretary of the State Board of Health, in response to a question, explained how it was possible to have water boiled and yet have it cold. It is not necessary to drink it boiling hot; but whenever the kettle is boiled, more water should be put in than is needed for the tea or coffee. The surplus boiled water should be set aside, protected from dust, and allowed to cool to the temperature of the air, then be poured into a covered earthen jar; and, if ice is used, it should not be allowed to melt in the water to be drank, but the ice and its impurities should be retained in a separate receptacle. A small earthen jar to contain the ice, placed in the water in a large earthen jar, the whole covered, and the outer jar provided with a faucet,—these constitute a convenient jar for drinking water. But such receptacles require frequent cleaning. Boiling will kill the germs of disease, and the water is perfectly palatable.

In response to a question as to whether freezing would destroy the germ, Dr. Baker said that it was known that a single freezing was not certain to destroy all the germs of typhoid fever. However, if water is frozen and thawed several times in succession the germs of that disease are all destroyed. But the ice we get has not gone through that process, and we should be careful as to our source of ice-supply. These germs of disease are not like arsenic or strychnine which may be diluted with water, but they go on and sprout and multiply. Contaminated water is often used for rinsing milk cans. For all household uses whatever, water from a suspicious source should be boiled. This is especially important for receptacles of milk because that is a fluid in which it is believed that the germs of typhoid fever may multiply.

Dr. Scott, on request, here exhibited and explained the map which he was to exhibit on the following day showing the relations of privies and cess-pools to wells. This map is printed farther on in these proceedings.

Dr. Baker, in response to a question whether a surface well or a deep well was the best, said that it was first necessary to know the quality of the soil and the upper strata of the earth in the locality. In Vicksburg the three feet and a half of clay was no great protection to the water-supply. In Richland township, in your county, the question arose a few years ago whether a cemetery located within thirty rods of a man's well would be dangerous. This case gave rise to a lawsuit. In order to ascertain whether the well was likely to be contaminated from the cemetery, the following experiment was made: The water of the well was tested for lithium and it could not be found. Then a salt of lithium was sown over the proposed cemetery, and the water of the well was examined each day thereafter, and on the 18th day after the lithium was sown, it was found in the well. This showed that water passed from the cemetery to the well, a distance of thirty rods. Either a surface well or a deep well might be dangerous. If under the first water-bearing stratum, there is another layer of clay—the chances of the contamination getting down are less. However these organic substances if destroyed at all are destroyed near the surface. We cannot depend on a lower stratum for this process of oxidation.

In response to another question, Dr. Baker said that he knew of no facts going to prove that germs stayed on the top of the water. In response to a question whether they were found in deep wells, he stated that they had been found in the chalk beds at Caterham, England. Typhoid fever had occurred in two towns supplied by that artesian water. In that instance, however, the contamination found its way directly into the conduit. But there is probably no great destruction of the germs low down in the earth.

Dr. Baker expressed the opinion that Vicksburg was better located than most villages for a system of water-supply and sewerage.

Rev. A. C. Webster said that the way to begin a sewerage system was to introduce a system of water-supply. There was no doubt of the need of a public water-supply in Vicksburg, where the crust of the earth was perforated with vaults, cesspools and wells.

SCHOOL HYGIENE.

BY GEORGE NEWTON, M. D., VICKSBURG.

During the past ten years school hygiene has been the subject of many able papers and learned discussions and I would consider the topic well worthy of the time and attention it has received. I do not expect to advance any new ideas or say anything that has not already been said or even present the subject in a more fitting dress.

The topic of general school hygiene is of very great importance, embracing, as it does, all the conditions and circumstances of life, favorable and unfavorable, from early childhood to the completion of school days. In order that children may arrive at school age with strong physical and mental endowments it is highly necessary that the hygienic environments of home be such, as will not only conserve the vital forces but will reinforce them from day to day and year to year.

Every dwelling should be so constructed as to allow the direct rays of the sun to penetrate if possible every room, and every room should be well-ventilated. Playfair, says: "In modern hygiene nothing is more conclusively established, than the fact that vitiated atmospheres are the most fruitful of all sources of disease." Frank Wells says: "Headache, nausea and lassitude, great debility, impaired digestion, severe colds, consumption and other diseases of the respiratory system, as well as other serious diseases, may be caused by confinement in the foul atmosphere of an unventilated room." Prof. W. A. Hammond, in speaking of the sanitary value of light, says: "In convalescence from almost all diseases it acts, unless too intense or too long continued, as a most healthful stimulant both to the mental and physical systems. The evil effects of keeping such patients in obscurity are frequently very decidedly shown, and can not be too carefully guarded against by physicians." The delirium and weakness which are by no means seldom

met with in convalescents kept in darkness, disappear like magic when the rays of the sun are allowed to enter the chamber.

The practical application of these remarks is this, that care should be taken, both in health and disease, to insure a sufficient amount of light to the inmates of houses, and that it is impossible to rear well-formed, strong, and robust children, unless attention is paid to this requirement.

Sun baths, in apartments where the solar rays can fall upon the naked body, are doubtless highly advantageous to health, and rooms for this purpose could easily be constructed in or on most of the dwelling houses. At present a chief object of many families seems to be to devise means for keeping the sunlight out.

Another important matter to be considered in raising healthy children is that of dress. The subject of clothing, from its hygienic standpoint, should receive much more attention than it does. One important object to be secured by clothing is uniformity of temperature. The average temperature of persons in health is 98⅘ F., and this is maintained by the conditions of the blood unless some counteracting influences prevent. Clothing may affect a normal temperature in various ways. Compression obstructs the free flow of blood, and consequently causes an unequal distribution of heat. Tight gloves and shoes result in cold hands and feet. A deficiency in quantity and quality of clothing permits an undue escape of heat, thereby chilling the surface and forcing inwardly surface blood, causing congestion of internal organs. One part of the body may be over-heated by a superabundance of clothing, while another part is suffering with cold. How often do we see children loaded with clothing about the chest and neck, while the lower parts of the body and limbs are barely covered. The results are obvious to those who give it a moment's thought. Fashion and custom have taken the place of better judgment in this matter, and the results are failing health of our children, and premature death. Flannel should be worn continuously, or at least should be put on as soon as fall weather commences and worn until early summer. In fact it is considered more healthful during all seasons of the year. In cases where flannel irritates the skin, gauze may be worn under it, which will obviate all trouble of that character.

In one of Mr. Emerson's essays he says: "Get health. No labor, pains, temperance, poverty, nor exercise that can gain it should be grudged, for sickness is a cannibal which eats up all the life and youth it can lay hold of, and absorbs its own sons and daughters."

There are certain abnormal conditions of the eyes of school children that seem to be increasing to an alarming extent, and sanitarians are making thorough investigations for the purpose of ascertaining the cause. In an article published in the Annals of Hygiene, October, 1888, and written by D. F. Lincoln, M. D., I quote the following: "It is generally accepted as proved that near-sight is very liable to be inherited. Far-sight (old sight), is also found in children, and, like near-sight, it increases in frequency and degree as children grow older, until somewhere about the age of fifteen it begins to be less frequent, and at the age of twenty, among students, near-sight decidedly preponderates over far-sight." Dr. E. G. Loring has given diagrams illustrating this fact in the case of three nationalities,—the German, the Russian and the American. The observers whose facts are taken for the diagrams, are Conrad, who examined 3,036 eyes of school children in Königsburg; Erismann, who examined 4,368 eyes of scholars in St. Peters-

burg; and Derby and Loring, who examined 2,265 eyes in New York schools. The ages in all cases run from the youngest to the oldest pupils, including members of superior schools, up to the age of twenty. In the German table the percentage of near-sighted eyes rises from 11 1–10 in the young children to 62 1–10 in the oldest; in the Russian, from 13 6–10 to 43 3–10 per cent, and in the American, from 3½ per cent, at six to seven years, to 26 78–100 per cent, in the twentieth to the twenty-first year. There are those, however, (as Laudolt) who lay the chief stress, as regards causation, upon general conditions of health, maintaining that hardship and poor fare constitute one of the chief causes of near-sight. It may be so, and this is not the place to enter into the argument satisfactorily; but if so, how shall we apply the doctrine to the case of Amherst College, where Derby's strictly accurate statistics show an increase from 44 2–10 to 50 8–10 per cent, during the four years' course? In Amherst the conditions of living are as favorable as can be found. "Not only is there no hardship and no poor fare," but the young men are under a regime of physical exercise which produces a distinct effect in lessening illness during their residence.

A brief statement of the leading causes not in any presumed order of frequency is given here: 1, inherited tendency; 2, study while the system is in a weakened condition; 3, study in a bad light; 4, study in a bad posture; 5, study while the eye or brain is fatigued or congested; 6, study in excess at the formative period of life, when the bodily tissues easily assume a wrong bent.

The State Board of Health of Pennsylvania, in a circular addressed to teachers, gives some very valuable ideas on this subject:

"In the school room, the eyes are very frequently injured. It is asserted that sixty-eight per cent of educated Germans over 21 years of age have impaired eyes. The eye troubles of highly civilized countries are rare among savages and those who have never been in school. Children should not sit facing the light. Let the desks face a wall without windows. The school room should be so well lighted that every pupil can see to read readily with the book held at 15 inches from the eyes. On dark days be sure that pupils in the middle of the room can see to perform their work. If curtains are used they should have the roller at the bottom of the window, as the most valuable light comes in from the top. Windows should not be filled up with plants. A dazzling light is nearly as bad as insufficient light. The best light comes over the left shoulder and from above. Sunlight should not fall directly upon the books or slates of the children. Blackboards should not be between windows. Where pupils are required to copy work from the blackboard the teacher should be very careful to write in a large and legible hand. The board must be kept clean, for pupils cannot see what is written on a greasy surface. Pupils should sit erect and not bend over their work. They should not strain the eyes at any time. Whenever a child complains that its eyes 'ache,' it should be excused from its duties and a note sent to the parents. Pale inks and greasy slates are injurious to the eyes. Children should not read when lying down, riding, or when sleepy. They should be seated so that they can perform their work properly. They should be encouraged to sit near the lamp at night and not as far as possible from it. Teachers should remember that the eyes are often too weak for purposes of study after measles, diphtheria, scarlet fever, whooping-cough, and other diseases of childhood. Some inflammations of the eyes

are contagious. Young children are sometimes called obstinate when they really cannot see.

"Children should be instructed to use their eyes on distant objects as much as possible when out of doors. So far as possible, children should be placed on seats of a proper height, their feet resting upon the floor, and the desk not too high above them.

"The back of the seats should curve in at its lower third, to fit the small of the back and thus prevent stooping. In all cases where a child is thought to be injuring the eyes, the teacher should send a note to the parents."

To seat a school room properly is probably as difficult a task as either heating, lighting, or ventilating. There have been many plans devised by those engaged in the manufacture of school desks and seats, and I believe the results have been reasonably satisfactory, as the seats and desks of today are far superior to those in use fifteen or twenty years ago. It seems to me that a school seat might be devised, susceptible of raising and lowering sufficiently to accommodate scholars of different heights, also a desk with an additional adjustment for placing it at the proper angle, not only to accommodate bodily comfort, but to place the work at right angles, or nearly so, with the axis of the eye. The physical deformities, caused by the desk being out of proportion to the seat, are probably far more than physicians or patrons of schools imagine. Lateral curvature of the spine is a deformity of quite frequent occurrence, and according to some of our late authorities, the cause is partially or in some cases wholly attributable to the unsanitary conditions of the school. The affection is of a passive nature, and occurs during the period of active growth. "The primary curve commonly occurs in the dorsal region, and the deviation is to the right, while the secondary or compensating curves are in the cervical and lumbar regions, and deviate to the left."

These abnormal conditions usually occur between the tenth and fifteenth years of age, or during the years of active school work.

You will notice that in all cases where the dorsal deviation is to the right, the right shoulder is unduly elevated, while the left is correspondingly, depressed,—the natural result of long continued study and labor at a desk so high as to compel the student to elevate the right shoulder, causing the spine to deviate from the perpendicular. "A lack of physical culture is the cause of many bodily imperfections, such as narrow, contracted chests, round shoulders, projecting shoulder blades, and lateral curvatures of the spine." As a preventive of spinal diseases, there is nothing more effective than an active physical training.

Among the ancients the Greeks were the best developed, and acquired the most perfect forms. The secret of their bodily symmetry consisted in the attention given to gymnastic exercises. The youth were regularly trained in athletic games, and schools for this purpose were supported at public expense in all the towns of Greece. The consequence was that few physical deformities were known among that celebrated people, and nearly all enjoyed that greatest of earthly blessings, sound bodily health.

DISCUSSION OF SCHOOL HYGIENE.

BY A. ARNOLD CLARK, LANSING, MICH.

I think that this is one of the most important subjects that will come before this convention, not only because every person spends one-third of his life in school but because it is the most important period,—the period when we are forming our habits of body,—our habits of mind and our habits of work. Whether we shall go through life with an abnormal eye or a normal eye, with bodies weak or strong, depends very largely on the conditions with which we are surrounded in school. If those conditions are not what they should be they should certainly receive attention at the hands of a sanitary convention.

It has been said that man's worst enemy is his own breath. Dr. Brown Sequard has proved that man in perfect health excretes from his lungs a poison deadly to himself. He estimates that every man in perfect health excretes in this way in 24 hours more poison than a snake could manufacture in the same time. If I had a jar here I might breathe into it until the oxygen in it was exhausted, and carbonic acid gas from my breath was left in its place, and then if I were to place a match in the jar its light would go out because there would not be enough oxygen in the jar to sustain the flame. If I were to place a mouse in the jar its life would go out for the same reason. When a century ago 142 English prisoners were shut up in the Black Hole of Calcutta,—a small room with only two openings—in a few hours 120 of them were dead because they had been poisoned by their own breaths. So when 50 scholars are shut up in the ordinary school-room they will breath up all the air in the room in a few minutes and if there is not good ventilation, each scholar will have to breathe his own breath over again,—not his own breath, for he can't assort it out, but must take it as it comes. These scholars will be like the mouse in the jar whose oxygen had been exhausted, and, though they may not die, their brains will be dull, stomachs sick, and they will leave the room in a weakened condition with the soil well harrowed for the growth and multiplication of the germs of disease.

There should not be in any school-room more than six parts in 10,000 of carbonic acid gas. Yet experiment in the schools of New York showed 14 to 27 parts, and experiments in the schools of Germany at different times has shown 20 times as much carbonic acid gas as there should be for perfect health. Dr. Kedzie says that in the school-rooms in this State there are frequently about 23 parts of carbonic acid gas per 10,000—or four times as much as there should be for successful work. Too much carbonic acid gas in a school-room is an indication that ventilation is not perfect and that those other poisons from body and lungs and the germs of disease are not carried off as they should be.

Every school should have 800 cubic feet of air space to each student, and yet there are schools in Michigan where each scholar has only about 100 cubic feet. We should remember in this connection what has been called "Farr's Law of Density"—that the nearer people live to each other the shorter their lives are, a law as applicable to the children in school as to the parents at home.

There are many other questions of importance which school boards should carefully consider,—the size of type and kind of paper used, the distance of the desk from the eyes, and the kind of light. The speaker said the light should fall over the left shoulder, but I have been in school-rooms with the light staring the student in the face so that it would be impossible to see the blackboard. The speaker said that the seat should be made to fit the child's back; but very frequently the child's back is made to fit the seat. It is said that 90 per cent of all spinal distortions begin during attendance at school. Of course it is not the intention to criticise school boards. They give what the people demand, but when we consider the importance of proper conditions at this period of life, we will see the importance of the people understanding just what they should demand.

Dr. J. Webster Fox says that going through asylums for the blind it is deplorable to see the number of those cases which might have been prevented by proper precautions in childhood. It is true that the eyes of over 100,000 children have been examined in Germany and it has been proved that near-sightedness increases with attendance at school. Prof. Agnew conducted similar experiments in New York, Brooklyn and Cincinnati and came to the same conclusion,—where only three in a hundred of the younger pupils were near-sighted, among scholars 20 years old 27 in every hundred were affected. "The near-sighted eye is an abnormal eye." Dr. Connor of Detroit says that a large number of statistics show that, among students of the same grade, where they study 2 hours out of school, 17 per cent are near-sighted, while among those who study 6 hours out of school 40 per cent are near-sighted.

For this reason I think the movement to do away with the recess in the public school is a movement in the wrong direction. It is estimated by the best authority that a very young child can only study one subject two minutes, between the ages of 5 and 8, 15 minutes, at 12 years of age, 30 minutes, but this not more three hours a day. I fear that teachers with trained attentive powers do not always appreciate this. The expert penman does not tire so quickly as the green hand, but after writing a few hours the muscles of his fingers tire. A man runs a mile and the muscles of his limbs need a recess. We talk of shoemaker's cramp and ballet dancer's cramp; so, constant application gives us the headache and makes us near-sighted, brain and eye cramp.

Too often we crowd the brains of our scholars with more than they can digest and they become intellectual dyspeptics. Like Dr. Blimber, we try to produce intellectual green peas at Christmas. The result is a loss of taste for intellectual food.

For instance, Dr. Lundy said at the meeting of the American Public Health Association, in Detroit, in 1883, that he then had a patient under his care suffering from some eye trouble, and that this patient had six recitations a day, each forty-five minutes long, that she was expected to study five hours at home, and did. Besides all this she studied music. Dr. Hammond, of New York, told recently of a girl brought to him suffering with St. Vitus dance. He found in her book bag an English grammar, arithmetic, geography, United States history, astronomy, physiology, French reader, French grammar, and a treatise on general science. He says that she had "learned these things at the expense of her brain capital, not her brain income." The brain had been using the sinking fund for running expenses.

It is no wonder that little Paul Dombey, after he had been under this sort of regime for a while, got the idea that Romulus and Remus were Troy weight, that the Continental Congress was one of the parts of speech, that *hic haec hoc* was a mountain in Asia, and 3 times 4 was 1776.

I do not think our school teachers are particularly to blame for over-pressure, but it would be strange if we did not find in the schools what we find everywhere else in America. The last words of warning left us by Herbert Spencer when he left this country were, that we did every thing too fast. In business, men worth millions fret and worry from sunrise to sunset as though they expected to go to the poorhouse tomorrow. Even in society we hurry. They say an Irishman is never at peace except when he is fighting. So an American is never at rest except when he is busy and excited. The result is, that insanity, and, I believe, nervous diseases are on the increase in the United States.

So I say the movement to do away with the recess and require more uninterrupted work of the student is a movement in the wrong direction, but in the right direction is the movement to introduce physical training in the public schools and thus alternate physical and intellectual labor.

Our scholars should be taght more of what has been called "muscular Christianity." Horace Mann says that when he was in college he was taught the movements of the heavenly bodies as though their keeping in their orbits depended on his knowledge of them, but he was kept in utter ignorance of the laws governing his own body, and as a result his life was one long battle with wasted energies. Better teach our boys as Thomas More, four centuries ago, said the Utopians were taught, that health is the the highest pleasure and that prevention is better than cure; so that, as he says, though no people had higher respect than the Utopians for medicine, there was no people who had so little need of it, because in youth their bodies were trained to physical strength.

Prof. Dewey, Alpena, stated that he had been engaged with schools during his entire life, and he had seen teachers grow paler and paler, thinner and thinner day after day, he had seen them sit with splitting headaches—all because they did not have enough air to breathe. There are many subjects of interest in connection with the subject of school hygiene. It is important to consider the seating. Men sit in these seats, and because they fit them they think they are all right. But the subject of ventilation is one of the most important. All have heard of ventilation for years. We know that our school-rooms are in many instances filled with carbonic acid gas, in which it is as impossible to do good work as it is to listen to a sermon in this church when it is not well ventilated. This church may have been shut up for some time, we come here and breathe the air which was left over. We open the windows at the top, and the fresh air, which has been warmed by the furnace in the basement, goes out there, leaving the foul air at the floor for us. In the first place the air should be brought in fresh and hot, and should be taken out where there is the greatest amount of foul air,—near the floor. If you have no furnace, put a jacket around the stove, and make a furnace of it and then bring in the air from out of doors through a hole in the floor. The reason why our children in school have the headache is that they have nothing to breathe but their own breath.

Second Session—Thursday, December 5, at 7:30 P. M.

After a solo by Mrs. N. Roe, A. Arnold Clark, of Lansing, gave the following address:

GERMS.

BY A. ARNOLD CLARK, LANSING.

"It is with the infinitely little that the infinitely great conquers us."—Victor Hugo.

Every day in the week and every hour in the day we greet some friend upon the street with, "How do you do?" or in some other way inquire concerning his health, because we know that to be healthy is to be happy, and when our friend tells us that he is well he does not need to add that he is hearty, that he is comfortable, that he is buoyant, that he is filled with happy hopeful dreams.

Yet how few of us ever stop to inquire just how do we really get sick, and just what is disease? We know, in a general way, that if we escape those diseases which are usually called epidemic, we will live on and on until this

Human Clock-work Runs Down,

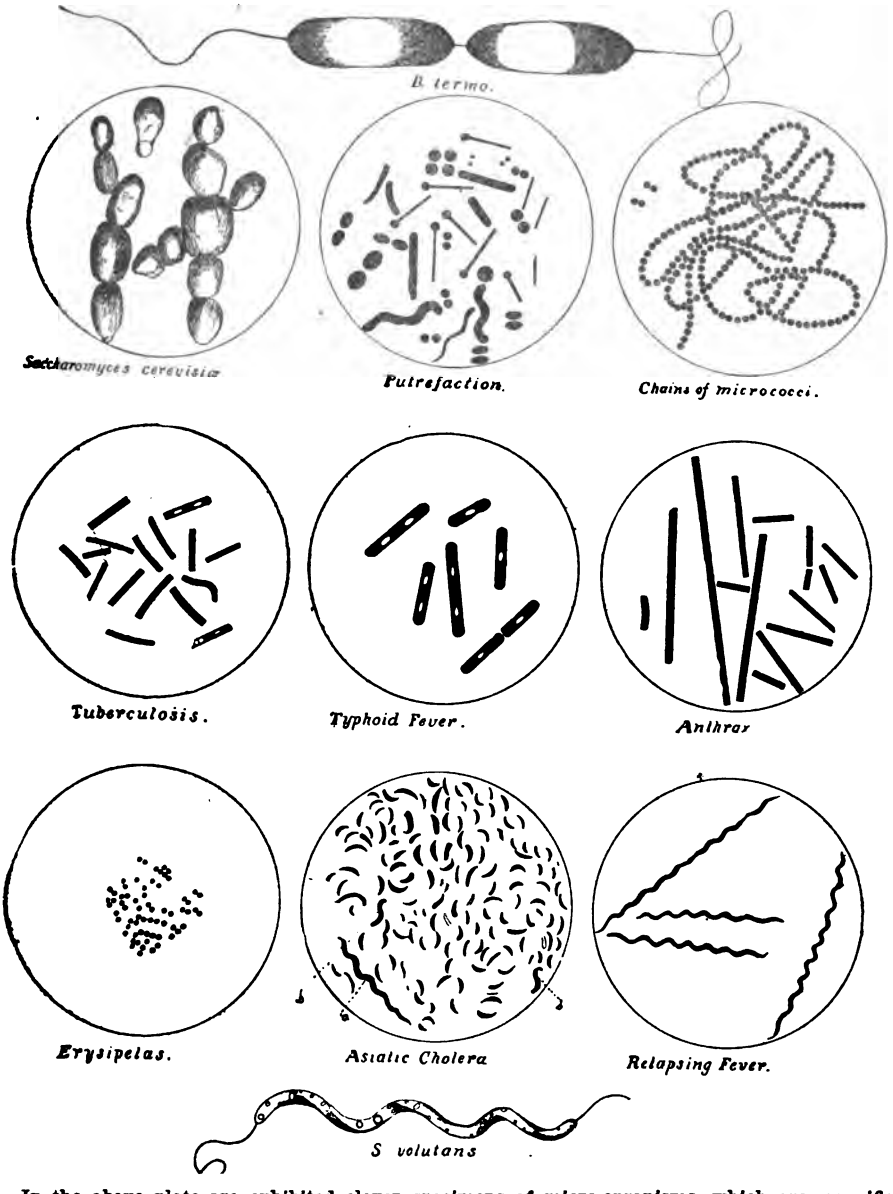
and we will die of old age.

But this seldom occurs. Over one-fourth of all who are born into this world die before they are five years of age, from those diseases incident to childhood. Escaping these, there is still danger of dying until ten years of age from diphtheria and scarlet fever. Escaping these, life is a continual battle with typhoid fever until thirty years of age. Escaping typhoid fever, the human race still continues to die from this great "white plague"—consumption. If this audience is an average Michigan audience, one person in every eight here tonight will die from this disease, and this is true, with slight variation, over the civilized world.*

What are these diseases which bring early mourning to so many homes, and how may they be prevented? If all which a man has he will give for his life, this is the most important question ever asked of any civilized audience in any civilized age.

It was formerly thought that these great plagues were a visitation of providence and people bowed the head meekly to what they thought was a divine punishment for sin. But we now know that disease is due not to the Providence of God but to the improvidence of man; and this great change in public thought has come about through the discovery of the germ.

*See the diagram in the following paper on Consumption for the relative number of deaths in Michigan from these different diseases.



In the above plate are exhibited eleven specimens of micro-organisms, which are magnified approximately, as follows:

Bacterium Termo, *about	2,000	diameters.
Saccharomyces Cerevisiæ (Yeast), about	500	"
Putrefaction (Bacteria) † about	1,200	"
Chains of Micrococci, ‡ about	1,400	"
Tuberculosis (Bacillus), about	1,100	"
Typhoid Fever (Bacillus), † about	1,100	"
Anthrax (Bacillus), † about	1,400	"
Erysipelas (Micrococci) † about	1,300	"
Asiatic Cholera, † about	800	"
Relapsing Fever (Spirillum), † about	1,300	"
Spirillum Volutans * about	500	"

WHAT IS A GERM?

It is a matter of common experience to wake up some fine spring morning and find your lot full of thistles growing where none grew before. Why? Because the seeds of thistles have been carried in the air from your neighbor's thistles and found a favorable soil in your front lot. It is a matter of common observation that grape juice left to itself will turn to wine. Why? Because the seeds of fermentation—infinitely smaller than the seeds of thistles—have found their way into this grape juice and grown a crop of fermentation. It is also a matter of common observation that wine left to itself will turn to vinegar. Why? Because another seed or germ whose business it is to make vinegar has fallen on this favorable soil and grown a crop of vinegar. When you can your fruit you boil it. Why? To kill the germs of fermentation in the can. And then you shut it up tight. Why? To keep out the germs of fermentation floating in the air. It is also a matter of common observation that meat left to itself will decay. Why? Because the germs of putrification in the air have found in this meat a favorable soil for growing decay.

It is also a matter of common observation that a boy perfectly well yesterday will wake up this morning sick with scarlet fever. Why? Because, just as there is one seed or germ which will turn grape juice into wine, and another kind which will make vinegar, and another kind which will turn sweet meat into carrion, there is another germ whose sole business on earth is to make well people sick with scarlet fever.

You thus see that there are

A GREAT MANY KINDS OF GERMS,

some of which are harmless to man and some of which are poisonous. There are constantly on the teeth about eighteen different kinds of germs.§ Man's mouth is a regular botanical garden. And yet we do not die, because these germs are not poisonous to man. These harmless germs abound on the money we use, the pages of the books which we read, they swim in the water we drink and swarm in the air we breathe. It is a germ which turns our milk sour, it is a germ which turns milk blue, and another which turns it red. The beautiful light seen at night from certain kinds of wood is caused by germs. But among all these there is a large family of germs whose sole business is to produce disease.

*"Bacteria," by Dr. Antoine Magnin and George M. Sternberg, M. D., F. R. S., p. 40.
†"Microscopical Technology," Dr. Carl Friedlaender. Frontispiece.
‡The Practitioner (London), Vol. XXXII, p. 261.
§See the third figure in the diagram on page 21.

You notice that I use the term germ or seed, because, though these germs sometimes behave more like animals, they really are minute vegetable cells.

Before we can have any of these phenomena two factors are necessary:

THIS SEED AND A SUITABLE SOIL.

The germ of fermentation finds this favorable soil in grape juice, the germ of scarlet fever finds the soil in the human body. And we may go to the Laboratory of Hygiene at our State University and we will find a long row of test tubes or bottles containing cultures of germs, some of them harmless to man, but among the labels on the bottles we will read: typhoid fever, cholera, consumption; and you may arrange a half dozen different animals in a row and inoculate each from a different bottle and you may produce a half dozen different diseases in those animals just as surely as a farmer may sow his farm with a dozen different kinds of seed and produce a dozen different crops. And as the seeds of thistles always produce thistles and not corn, so the seeds of scarlet fever always produce scarlet fever and nothing else, and you can't get scarlet fever unless you have the germ and you can't get the germ except from a previous case of scarlet fever. When you ladies can fruit, if you keep the germs out

THEY DO NOT DEVELOP SPONTANEOUSLY IN THE CAN.

So the germs of scarlet fever no more arise in the air out of nothing than birds do.

It was formerly thought that animals developed spontaneously. Von Helmont gave a formula for the spontaneous production of mice: "Take a dirty shirt, put into it some grains of wheat, subject the whole to heat, and at the end of a certain time there will be a transmutation of the wheat into mice." People used to think that the ooze of the Nile turned into eels. So when contagious diseases were first studied it was claimed that they developed *de novo*. Scarlet fever and diphtheria were attributed to dirty surroundings. But there was no scarlet fever in this country until the germs of scarlet fever were brought to this country 150 years ago from a previous case, and if the germs of scarlet fever were all destroyed tonight, scarlet fever would be again a disease unknown. Diphtheria no more arises from the smell of decaying vegetables than bees are generated by the smell of decaying meat, as Virgil believed. Bad smelling marshes no more give birth to typhoid fever than to snakes and frogs, as the ancients thought. You can no more spontaneously generate a case of glanders than you can the horse that has it.

This is not intended as sanitary license to any man to have unsanitary surroundings. To be sure a man may live in dirty surroundings and yet never die of a communicable disease unless he gets the germ, but these filthy surroundings simply harrow the soil for the better growth and multiplication of these germs when they come. For example, a man may breathe the germs of consumption into his lungs and not get consumption, because his lungs are so healthy and vigorous and he is so strong that the germs are thrown off—they do not find a congenial soil.

All of those old questions of sanitary science, ventilation, sewerage and water-supply have a new meaning when studied in the light of the germs. You often hear a man say that he has drank bad water all his life and that

he is not dead yet, much as a man might refuse to get his life insured because he always has lived. But he may be telling the truth. You may drink water from a well located only a few feet or rods from a neighbor's vault and your well water may come from the vault and you may drink this filthy water a life time if you enjoy that sort of thing and never get sick, but suddenly there is a case of typhoid fever in that neighbor's house, the germs of typhoid fever find their way to that vault and to your well, and then you are drinking not only the filthy water but typhoid fever as well.

Perhaps you would like to know

HOW THESE GERMS LOOK AND ACT.

Under a high magnifying power some of them look like a dot. These are called micrococci, others are rod-shaped and called bacilli, others are shaped like a cork-screw and are called spirilla.

The largest of these germs is the *spirillum volutans*,* which is one three hundredths of an inch long,—a perfect giant. There are germs so small that twenty-five thousand placed end to end would only cover an inch.

Cohn, describing moveable bacteria, said that, swarming in a drop of water they looked like an ant hill. They sometimes go in pairs, then form themselves into beautiful chains.* Swimming forward, they stop and without turning around dart suddenly backward, thus forward and back as if executing the movements of a quadrille. Remaining motionless a long time, they dart suddenly forward "like an arrow," "spin around like a top" and swim like a fish. It is almost impossible not to think of them as possessed of consciousness and having a good time. Dr. Kedzie describing a drop of water full of bacteria, said it looked like an "animated skating rink."

These germs multiply and reproduce very rapidly. Though no larger than the point of a pin, they actually lay eggs, or more accurately speaking (for they are vegetable) they form seeds or spores. They also multiply by division,—one germ separating into two. Though they are so small that we can not see them, it is estimated that in a few days the descendants of one germ would fill all the oceans of the earth, and though they are so light that Tyndall saw them dancing in the sun-beam of a darkened room, yet in a few days, it is said, the descendents of one germ would weigh many thousand pounds. They do not, as a matter of fact, multiply so rapidly because in their growth they produce a poison in which they can not live, but this poison which destroys them also destroys us. And just as the germs of fermentation break up the sugar of the grape juice into alcohol and carbonic acid gas, so the germs of scarlet fever, entering the body, break up the body compounds into poisons which ultimately destroy us,—each germ producing its own peculiar poison, its own peculiar symptoms.

So each germ has its own

FAVORITE SOIL IN THE BODY.

The germs of cholera and typhoid fever enter the body through the water we drink and seek the intestinal tract. It it probable that typhoid fever can not be communicated through the air which we breathe unless the germs in some way find their way into the stomach.

*See Diagram on page 21.

Typhoid fever is not always spread by the drinking water. There was a severe outbreak of the disease at the State Prison in 1888. The State Board of Health went to investigate. A bottle was exposed over the entrance to the sewer and Dr. Vaughan afterwards found the germs of typhoid fever in the sewer air collected in this bottle. Dr. Baker also carried away some germs, but his were collected in his mouth and as a result he had typhoid fever, though he did not eat or drink at the prison. It is probable, however, that the germs in some way found their way into his stomach. The germs of diphtheria, scarlet fever and consumption, on the other hand, enter the body through the air which we breathe, the germs of diphtheria finding a favorite soil in the membrane of the throat, the germs of consumption in the lungs.

These little rod-shaped germs which cause typhoid fever* have been found in the water drank by typhoid patients. These germs have been made to grow in beef broth, and, inoculated in dogs, a regular run of typhoid fever has been produced the same as in man. The other little rod-shaped germs which cause consumption* have been found in the sputa from consumptive patients,—yes, on the walls of rooms inhabited by consumptive patients; these germs have been sprayed into the air, dogs have been placed in the inhaling room and compelled to breathe these germs and they have afterwards died of consumption.

In other diseases animals have not been inoculated with the germ, indeed the germ has not been isolated with certainty, and yet we know that these diseases are caused by a living germ which multiplies and reproduces after its own kind. You will notice that this diagram does not contain the germs of small-pox, diphtheria and scarlet fever, because it is not known yet how those germs look, and yet there is no doubt that small-pox is a disease caused by a specific germ.

Two or three years ago a Pullman car conductor came in contact with the germs of small-pox in his car near Chicago—passed through your village on the Grand Trunk to Montreal, and was taken sick with the disease. No pains were taken to kill the germs, the ignorant inhabitants refused to vaccinate, declaring it a "wicked attempt to thwart the will of the Almighty," and in a few months over 3,000 people in Montreal died of small-pox as a result of the one case.

It was carried to different parts of the United States; Michigan, the most exposed of any State, escaped, because Michigan had at her great ports inspectors of travel who vaccinated all who came through, and disinfected all clothing, thus killing the germs.

Every day in the week there are cases of diphtheria and scarlet fever in this State where the germs have been carried in the hair or clothing, where they have been carried long distances by letter, where they have lingered in the bedding or carpet, or have been hiding for years in the rubbish of the garret, as vigorous and vicious today as when they first emanated from the body of the infected person.

Now, the most important question ever asked of any civilized audience is

WHAT SHALL WE DO TO BE SAVED FROM THESE GERMS OF DISEASE?

We saw how the germs of typhoid fever were carried in the water, and the purity of your water-supply will be discussed tomorrow night. Not to dis-

*See Diagram on page 21.

cuss this subject, let me emphasize the necessity of boiling the water when there is any doubt. I emphasized this this afternoon, and I emphasize it now because I am very anxious to see the enthusiasm of this convention reach the "boiling point." The question was asked this afternoon,—should the water be always boiled or only when there was doubt. You should certainly boil it at times of year when typhoid fever is most prevalent, but why not always? Man has been called the "cooking animal." You remember the lines of Hood:

"Ergo by logic we repute
That he who cooks is not a brute."

"If you at savage feeders look,
The less refined the less they cook."

"So men are distinguished as they eat
And raw in manners, raw in meat."

Owen Meredith expressed the same idea when he said:

"We may live without poetry, music or art,
We may live without conscience, and live without heart,
We may live without friends, we may live without books,
But civilized man can not live without cooks."

The Australian puts a stick down into an ant hill, puts his mouth over the hole, lets the ants crawl up into his mouth and makes a very good dinner; but civilized man cooks his food. Still, civilized as we are, we insist on taking our water, as Mr. Quilp took his whisky, raw.

We are even behind the Chinese in this respect. They have a filthy water supply, they live in boats along rivers and their sewage is emptied into the same river from which they take their water-supply, and yet the diseases spread through a contaminated water-supply are unknown among them, because they always boil the water they drink and would no more drink it uncooked than we would eat uncooked potatoes.

But the germs of these other communicable diseases enter the body through the air which we breathe. How can they be destroyed?

You may have heard of many disinfectants, but experience in this State has proved that the

FUMES OF BURNING SULPHUR WILL DESTROY THESE GERMS.

You will find it demonstrated in the reports of the Michigan State Board of Health that during the last three years hundreds of lives have been saved by isolating those sick with diphtheria and scarlet fever, and then, after death or recovery, burning sulphur to destroy the germs hiding in the house. Sulphur has long been a good orthodox disinfectant for the next world; we now know that it kills the little devils in this.

You know it was an old idea that disease was caused by the possession of devils, and that the way to cure disease was to cast these evil spirits out. Our forefathers used to prick the affected part in the hopes of thus letting the evil spirit out, in much the same way that the Indian medicine men now gather about a patient, one playing the tom tom to scare the devil out, one pronouncing an incantation to charm the devil out, another jumping on the

patient's stomach to stamp the devil out. If the devil doesn't kill the patient the doctor usually does. Now disease is caused by the possession of evil spirits—these germs, but these little devils, strange as it may sound, can not live where sulphur is burning.

According to an old French poem, Death once held a prize contest among his various agents, and there were represented among the rest, War, Pestilence and Famine. But according to the poem, the prize went to Intemperance. Without underestimating the evils of intemperance,—intemperance which has filled so many homes with misery,—I still believe that the best friends of Death and

The Worst Enemies of Man are these Germ Diseases,

which we now know how to prevent. Intemperance causes comparatively few deaths, and there is often the feeling that the poor wrecked life is better in the grave; but over one-third of the deaths which occur in this State are from these germ diseases which we now know how to prevent,—diseases which rob us of our loved ones when they are in the innocence of childhood, the joy of motherhood and the vigor of manhood, when they are filled with happy, hopeful dreams.

Prevent these diseases, and there will be more of these gray heads which I see about me now. Prevent these diseases and death will come, not as the poet said, "like some untimely frost upon the sweetest flower in all the field," but in the autumn of life and with the gathered grain and when the fruit has fallen from the trees.

Then Death will come as it came to the aged historian Hume, who said in his dying hours that every minute he was growing weaker, but all which he expected to accomplish he had done, and there was no excuse which he could offer Death for staying any longer, who was willing to "let the music stop" when the organ was "worn out." God speed the day when this may be the common end of all,—when surrounded by those we love, happy, peaceful and serene, the organ will "wear out," and like the lingering strains of a melody, our lives will pass away.

On motion, Dr. Henry B. Baker, Secretary of the State Board of Health, was requested to read, and did read that portion of his paper (which was to be read the following evening) which relates to consumption. It is printed in the paper on the "Restriction and Prevention of the Dangerous Communicable Diseases," further on in the proceedings.

A. Arnold Clark then being called upon, made the following remarks upon the Prevention of Consumption:

THE PREVENTION OF CONSUMPTION.

BY A. ARNOLD CLARK, LANSING, MICH.

Dr. Baker said that he would speak only a few moments, and yet during the few minutes that he was standing upon this platform, some two or three citizens of the United States,—men and women filled with happy, hopeful dreams,—men and women to whom life is joy, have surrendered their lives to this Destroyer. I have here (next page) a diagram accurately drawn to

DEATHS IN MICHIGAN, 1876-'87.
CONSUMPTION.
DIPHTHERIA.
TYPHOID FEVER.
SCARLET FEVER.
WHOOPING-COUGH.
MEASLES.
SMALL-POX.

scale, showing the relative number of deaths from different diseases, and from this you will see that every time one person dies in Michigan from small-pox forty or fifty die from consumption. And yet, though there is no disease which causes so many deaths, there is no disease about which scientific men know so much and which they could so easily prevent if the people only knew.

A great change has come about recently in opinion as to the relative parts played by heredity and the germ in the causation of this disease. Though the lungs of children of consumptive parents may have a lower vitality and less resisting power, the cause of the disease is known to be a specific germ, and 999 cases out of every thousand are communicated from person to person, and it is these cases which we must prevent. Where does consumption generally first appear? In the lungs, because the germs of consumption are carried to the lungs in the air which we breathe.

Dr. Baker alluded to the fact that the germs of consumption have been found on the walls of rooms where consumptives have been. These experiments have been conducted by Dr. Cornet, of the Berlin Hygienic Institute. He found that the sponge scrapings from the walls of rooms inhabited by consumptive patients, inoculated in guinea pigs, produced consumption in those animals.* Sponge scrapings from the walls of rooms where no consumptives had been did not, on inoculation, produce consumption in the guinea pigs. Now how did the walls of those rooms become contaminated with the germs of consumption? Not by the breath from the consumptive patient. Guinea pigs have been placed in a rubber sack and they have been breathed upon two hours a day for six weeks by consumptives without contracting the disease.† So, the danger is not in the breath.

Cornet found that where consumptives had invariably expectorated in cuspidors filled with water, the dust from the walls of the room showed no germs; but where the sputa had been allowed to dry on the floor, the germs had risen with the sweepings and covered not only the walls but the pictures, dishes, the bed, and everything in the room,—so virulent, as to produce the disease several weeks after the patient had left the room. It is then from the dried sputa of consumptives that this great foe of the human race scatters its seeds. This is proved beyond question. These germs have been found repeatedly in the sputum, in the dried fly specks on the windows of rooms inhabited by consumptive patients, the flies having fed upon the sputa.

Animals feeding on the sputa of consumptives die of consumption. Dr. Cagny‡ tells of a young consumptive who took care of a large number of fowls, and who amused himself by coughing for the amusement of the chickens, which

Greedily Devoured the Sputa.

Many of the chickens died of consumption, and the germs of consumption were found in the dead chickens.

*Zeitschrift für Hygiene, Vol. V, pp, 191-331. See also references to this subject in London Lancet May 19, 1888; Phthisiology Historical and Geographical, pp. 275-277; Fourth Annual Report State Board of Health, Maine, 1888, pp. 199-212; also Buffalo Medical and Surgical Journal, June, 1889, p. 689.

†Experiments by Graucher, mentioned in Centralblatt für Bakteriologie und Parasitenkunde, Vol. V, p. 289. Similar experiments with similar results were made by Cadeac and Mallet on rabbits. Revue D'Hygiene, Vol. X, p. 255.

‡Transactions of Congress for the Study of Consumption, Paris, Vol. 1.

Consumption has been produced by inoculating with the sputa, by swallowing the sputa, by breathing the sputa. The disease has been transmitted to cattle, pigs, sheep, rabbits, rats, mice, dogs, monkeys and men.

When Tappeiner was causing dogs to

Breathe the Pulverized Sputa of Consumptives,

a robust servant of forty laughed at the idea that consumption could be caught in this way. In spite of warnings he went into the inhaling room, breathed the sputum dust, and got the consumption just the same as the dogs. In fourteen weeks he died of consumption. *

Thousands in Michigan every year do unconsciously just what this man did consciously and willfully; and when we think of the ten thousand consumptives in Michigan who every hour in the day are expectorating along our streets and even on the floors of public buildings, postoffices, churches, hotels, railroad cars and street cars, when we think how these germs are being dried and carried into the air by every passing breeze, by every sweeping, and how they are capable of producing the disease six months after drying, when we think of the miscellaneous crowd sleeping in hotel bed rooms, when we think of the close, unventilated sleeping car with hangings and curtains so well calculated to catch the germs and where, as some one has said, the air is as dangerous as in those boxes filled with pulverized sputa where dogs are placed for experiment; then when we remember that man's lungs are a regular hot-house for the growth and multiplication of these seeds of consumption, is it any wonder that one citizen in every seven dies of this disease? And if a human life is worth anything to the State, is it any wonder that the State spends money to hold such conventions as this where the people may be told how they may destroy these invisible yet almost invincible germs swarming in the air we breathe.

DESTRUCTION OF THE SPUTA.

Now, the object of this discussion is not to make you afraid to breathe, but to make you so dread the sputum from consumptives as to insist on its destruction. Every person after coughing a month or so and raising sputa, should have a microscopical examination of the sputa both for his own comfort and for the public safety. No consumptive should be allowed to expectorate on the floor or street, and all sputa should be disinfected or burned. The disinfection of the sputa has been recommended by the American Public Health Association, by the Michigan State Board of Health and by many other boards, and if it were universally carried out there would be two or three thousand less deaths in Michigan every year.

But you say that you have not the consumption, you cannot go around seeing that your neighbor disinfects his sputa, are there no

PERSONAL PRECAUTIONS

which you can take? Yes! It does not follow because we breathe the germs of consumption that we will get the disease. Our lungs may be so healthy

* Buffalo Med. and Surg. Jour., June, 1889, p. 637. Dr. Gautier, a French physician, in similar experiments, accidentally breathed the sputum dust and contracted the disease. Science, Vol. XIII, p. 162.

and vigorous that the germs will not find a congenial soil. Dr. Trudeau's experiments show that when animals are inoculated, if they are kept in good sanitary surroundings, the disease is sometimes arrested. So post mortem examinations show that a great many men and women are attacked by consumption sometime in life and they recover from it. They have such good food and air and their lungs are so healthy and vigorous that the tubercular process is stopped. Consumption never attacks wild oxen but it is a great catch for tame elephants and pet canaries, for foreigners who try to accommodate themselves to the food and habits of another race. It yields a higher death-rate in the closely crowded cities, in the great industrial centres, than in the open country. One-half of all the deaths which occur in States' prisons are from consumption, and Ziemssen says that imprisonment for fifteen years is equivalent to sentence of death by consumption.

Any environment which weakens the system or irritates the lungs simply

HARROWS THE SOIL

for the easier cultivation of the seeds of consumption. It may be the irritating dust from a factory, or it may be only a hard cold. All of these unfavorable conditions you may avoid. You may strengthen the body in every possible way. You may go further:

Without considering the question at length, it is known that consumption is a very common disease in cattle and may be communicated to man by the milk which he drinks and the flesh which he eats. Now, you may boil all the milk which is suspected, to destroy the germs, a meat inspector may destroy the flesh of all tuberculous animals, and all of this will do good. But more important than all this, more important than anything else—let me emphasize again in closing—the disinfection of the sputa.

The consumptive should do this for his own good, because, when he continues breathing the germs of consumption from his own sputa,

HE CONTINUALLY RE-INFECTS HIMSELF,

and thus diminishes his chances of recovery. But more than this the people should demand it for their own safety. It is more important than to fortify our bodies. It is better to kill the germs before they commence trying to kill us. You have probably heard of the Irishman who swallowed a potato bug and then swallowed Paris green to kill it. If a battle must go on with the germs of consumption, I prefer it to go on outside of my body, and the place to take the germs at a disadvantage is in the sputa.

This plea for the disinfection of the sputa may seem a rather prosaic and commonplace recommendation with which to close a long speech,—something like those long column articles in the newspapers, which picture the horrors of some disease and close with an innocent little line at the bottom, —"Use Warner's Safe Cure." But when I look at this diagram, more eloquent than words, when I think of the thousands who every year are cut off in the prime of life, I sometimes feel that a man could not have a better epitaph written over his grave than this:

He Taught Consumptives to Destroy Sputa.

Every day in the week and every hour in the day one citizen in seven is giving to every passing current and to the four winds of heaven those seeds which surely mean a wrecked ambition and an early death to some fellow creature. Every hour in the day that great "reaper whose name is Death" is gathering with his sickle where we, in our ignorance, have sown the seed. And yet a nation which has spent thousands of dollars studying the diseases of peaches and pears, a nation that has spent thousands of dollars to protect its fish and the young seals of Alaska, has never given a dollar for the study or prevention of consumption in men. If Jefferson and the signers of the Declaration were right, and the first object of government is to guarantee to all men the enjoyment of life, surely that work is highest and noblest whose object it is to prolong the lives of millions and to endow those lives with health and strength.

Mr. Clark then answered questions as follows:—

Question. In case a man sleeps in a room where one of these communicable diseases has been, are there any precautions which he can take the next day?

Answer. Yes. In case the exposure has been to small-pox, the man exposed should vaccinate the next day, because the period of incubation of cow-pox is known to be shorter than the period of incubation in small-pox, and, in case of exposure to small-pox, vaccination immediately after will work before the small-pox has a chance, and the disease will be modified in malignancy,—the patient will have varioloid. After learning that I had slept in a room where there had been a case of consumption, I should either disinfect the room with sulphur, or I would rent another room. The Italians have for some time believed in the contagiousness of consumption, and they will even desert a house where there has been a case of consumption.

Q. I have heard it said that, if one would keep the mouth closed we would be less likely to contract a contagious disease. Is that true?

A. Very likely. The moist nasal passages might stop the passage of these germs. Not that it would be safe to go to such a place, but, closing the mouth, there would be perhaps less danger. I certainly should not go to such a place if I could help it, but if obliged to go, I should certainly keep my mouth shut. You may think that one of the impossibilities, but I certainly should try.

Q. How do you account for those isolated cases, where there seems to be no contagion?

A. I think they are due to our ignorance of all the environment—all the surroundings—all the exposure. I have a case in mind where the exposure was known, I believe, to only one person. In 1874, there was a case of scarlet fever in a house near Laingsburg. The curtains that hung in the room, the doll with which the child played and some other articles were packed away in the garret. Five or six years later another family moved into the house and cleaned out the garret. Part of the stuff was burned, but the girl took the doll with which the sick child had played, and the two boys took the pictures. In ten days the three children were sick with

scarlet fever. Here was a case which, if the circumstances had not been known to one man, would have been called a case of spontaneous origin, as there was no other possible exposure.

Q. How do you account for immunity after the first attack? Why don't we have communicable diseases twice?

A. We sometimes do. People even have small-pox twice, and after having small-pox, vaccination frequently "works." But the immunity may be explained in this way:

It is a favorite notion of modern physiologists that the human body is a sort of body politic,—a commonwealth inhabited by an immense multitude of living cells. These cells work together in the common object of building up the tissues of the body,—turning food into muscle and nerve.

These invisible cells have their invisible enemies; these enemies are these germs of which we have spoken. When these germs of disease gain an entrance to this citadel—the human body—through the air we breathe or the water we drink, they commence what Virchow calls a "struggle" with these cells, and we very properly speak of an "attack" of disease.

Now, as to the question of immunity, the way some put it is this:

The cells have been educated by the first attack so that they better understand the military tactics of this hostile tribe, and thus acquire vital resisting power. Others say that the germ leaves behind it this poison, or ptomaine, of which you have heard tonight, in which others of its kind cannot live. Probably there is an element of truth in both ways of putting it, but the point of especial interest in this connection is its bearing on vaccination. Whichever of these explanations suits us best, it is enough to know that a conflict with the weak members of one of these malignant tribes fortifies our bodies just the same as a conflict with the most malignant. Now we can weaken these germs, introduce them into our bodies, they are easily conquered by the cells and we are vaccinated. The germs don't lose their nature at all. As some one has said, the rattlesnake has not been changed into a frog,—we have simply extracted some of its poison fangs.

Q. Would it not be better to disinfect with the fumes of sulphur in all of these communicable diseases?

A. Yes, the State Board of Health recommends the fumigation with sulphur, even in cases of typhoid fever, though the most important disinfection in this disease is the disinfection of the discharges.

Q. Is there not more danger in a crowded community?

A. Yes, experiments show these germs to be more abundant in the cities of London and Paris than in the suburbs and more abundant in the suburbs than in the country. They abound in crowded rooms. It is these germs, as Tyndall showed, which enable us to see the sunbeam dancing in a darkened room. The higher up you go the less the number of germs. Some one has facetiously suggested balloons as a health resort. Between one and two hundred miles out at sea very few germs are to be found, and sea breezes coming over this distance are comparatively free from germs.

But nearly everything we touch contains these germs. Experiments made with the books in the circulating libraries of Dresden show that where the leaves of the book are turned with the dry finger, not many germs are found on microscopical examination, but where the finger is wet many germs are found. All of these happened to be non-pathogenic germs, but if a child

sick with scarlet fever had been reading that book, the disease might have been spread in that way.

Experiments show that the coins and paper currency of Germany are covered with bacteria. In more senses than one it is "filthy lucre." Perhaps your child is carrying in its mouth the penny that has been paid out by a diphtheritic patient.

Third Session—Friday, Dec. 6, at 2:00 P. M.

After music, by Mrs. E. Hill, Bertha Clement, Mrs. O. B. Dunning, Rev. A. C. Webster, and Fred Robinson, the following paper was read:

DISPOSAL OF EXCRETA AND WASTE IN VICKSBURG, AND THE RELATION OF PRIVIES AND CESS-POOLS TO WELLS.

BY W. W. SCOTT, D. D. S., VICKSBURG.

There are some things we dislike to think about, much less to talk about in public. There is no man so perfect that he is without his faults. And much as the strong man may rejoice in his success and glory in his prosperity, there are times when he is compelled to look at his weaknesses and mourn over his failures.

And as this is true with man, so it is equally true of villages, cities, states and nations. "None perfect, no, not one." While I am proud of our village of Vicksburg and its general cleanliness and healthfulness, it too has its defects. Our committee on program have seen fit to give me the *opening* of the discussion on the subject announced by our president. I say "opening of this discussion," because I can only hope to prepare the way for the advice of those here who have given this subject more study and care than I have.

Unpleasant as this subject may be, it is an all-important one for us to consider, because we can all be benefited by its careful consideration. Those who need most to be instructed in the principles of honesty, cleanliness and other Christian virtues, are the most difficult to draw to the lecture room or church where they may get good food for mind and soul. So it is with those most slovenly and negligent about their surroundings; they will hardly be here today to hear your advice, and, while I am glad to see the house so full, I wish others might be with us and be profited.

If we take a quantity of material, the smell of which would produce disgust and sickness if placed in our house or near our doors, spread this out over a few yards of garden or field soil, and spade or plow it under, we may have a rich fertilizer instead of a disgusting nuisance. And although most of us might spleen against such a fertilizer for our garden, yet I think there would be little danger of harm coming to us from that source, provided there were no depression or stagnant water where this material was used. The all-wise God, our creator, has so arranged the workings of his great chemical laboratory that by the action of earth, water, air and sun the foul can be made clean, the apparently worthless made useful. And I doubt if disease germs were ever picked up in the sap and carried through

the roots, up the stalk, out through the branches, into the essential fruit of a tree or berry of grain, as disease germs.

Nuisances that are on the face of the earth are much less dangerous than those hidden from sight, as they are apt to send off their offensive odors, constantly, reminding the passer-by of their presence, and someone will probably make a fuss about it and it will be cleared away.

I think the greatest danger is in our water-supply. We may not seriously object to eating our proverbial "peck of dirt," but we do spleen against taking it in our drink, especially when it comes to us from the slop-bucket through the cess-pool or privy vault to our well.

I have been told that grain taken from the mummy tombs in Egypt, where it had lain for ages, when planted, sprouted and grew; and if a grain germ can sleep a thousand years and under favorable circumstances spring to life again, why should we not expect the same of a disease germ?

I know the soil is a wonderful purifier. I once took half a barrel of cider, brown with pumace, filtered it through a half bushel of washed sand, and had cider clear as water to all appearances. But this clearing power of the sand will not last long. But our privies are frequently changed from one place to another; the old vaults where they stood are carelessly covered over with earth, and the place forgotten. A well may eventually be sunk where once one of these foul pits was and, if nothing has been used to destroy disease germs left there, might not these germs be carried years hence into the water-flow through the pump into the stomach of some unfortunate drinker, again be fanned into life and activity and cost the lives of thousands of human beings. And here comes the all important question to us, how shall we destroy these disease germs, how shall we prevent their multiplication?

I would that we had a complete water and sewer system that all these impurities might be carried off, but, as it is not so today, we must say:

(1.) Do not allow the accumulation of vegetable or animal waste in your back yards. If posible, put kitchen waste in slop barrel and have it taken away out of the village to be fed to hogs, but if this is not practicable, burn all bones, parings, etc. They would make good fertilizers if spaded in your garden, but it would be better to burn them than to let them lie around to pester you.

(2.) Never throw dish or wash water in a hollow, thereby creating a cess-pool; it is better to throw it on a knoll, that it may spread out.

(3.) In privies, a box, pail or drawer should be used, and the contents should be frequently treated with dry earth, coal ashes or other absorbents, and frequently emptied in the field. If vaults are used they should not be deep enough to reach the coarse sand or gravel. Chloride of lime or dry earth should be freely used, and the contents of the vault should be pumped out frequently by men who make this work a business—but the vault system is a nuisance.

(4.) Then we come to the vessels used for excreta in the sick room, and here the most efficient work can be done in destroying disease germs. I might suggest that some known chemical might be placed in the cuspidor or vessel, before use, that might at once destroy disease germs when deposited in them. I might mention some of the most common, but as we have able men with us today I will leave it to them to name the agents best to be used.

It has occurred to me that our State Board of Health, which has such matters under its consideration, might have something prepared, at the expense of the State, in a convenient form for keeping and use,—if a liquid, in a tin can or glass bottle, if a powder, in a box or package. Let the package be carefully labeled, with full directions for use, and have these placed in the care of local health officers, to be used in any house where contagious diseases are *supposed* to be.

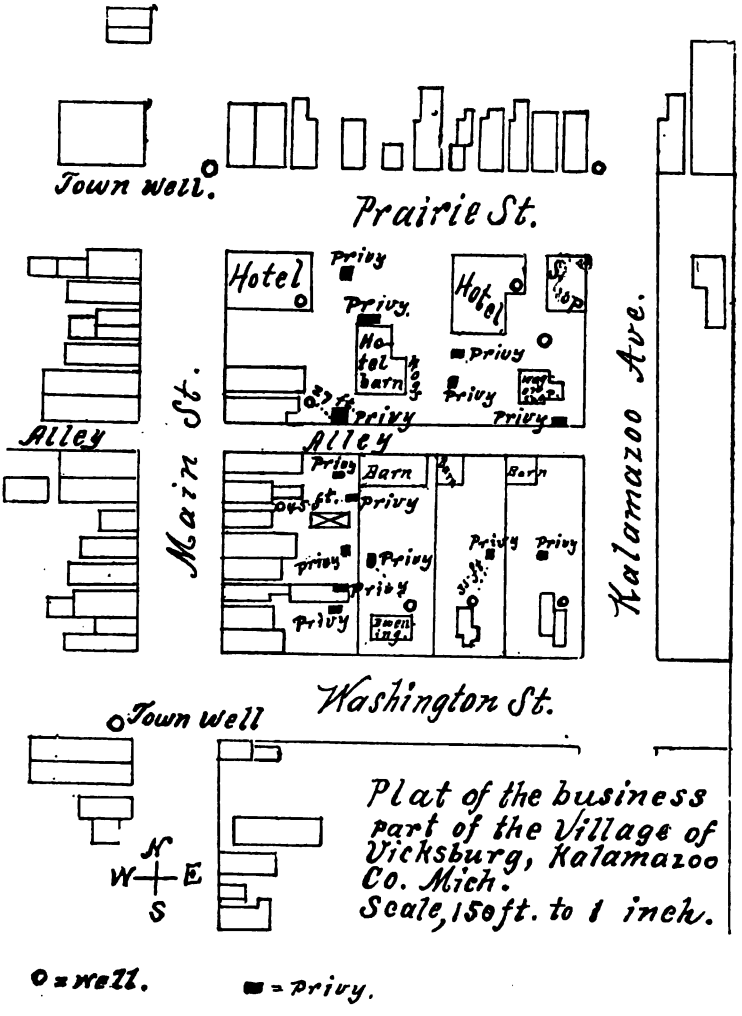
As requested by our committee I have here (opposite page) a diagram or plat showing two of our business and resident blocks. The business houses and the dwellings are, as you see, so marked. The location of wells is indicated by a round mark (O); the privies are indicated by a black square ■, and you will see that the nearest of these to a well is 27 feet, another is 38 feet and still another but 35 feet, while old covered vaults are still closer. Most of the water used by the people of these blocks is taken from the two town wells at the corner of the blocks, as marked on plat. These are well away from privy vaults, but I think there is danger from these privy vaults, as I am confident that there is a great lake or river of water below us at a depth of from 12 to 20 feet, constantly flowing from north to south or from northeast to southwest in sand and coarse gravel strata, varying of course as it may be turned by a varying density of soil but nevertheless *constantly slowly flowing* on, and how long before our well water will be poisoned from privy vaults I do not know, but there is danger from this source. I know we would all be glad to have advice from those here who are competent to speak from their extensive knowledge gained by a careful study of these matters, because they may aid us in averting these unpleasant results, which we dread.

DISCUSSION OF THE SUBJECT OF THE DISPOSAL OF EXCRETA AND WASTE IN VICKSBURG.

Prof. Delos Fall, member of the State Board of Health, in opening the discussion, stated: There is much conservatism in science, but sanitary science is recognized to be a science, although it has had to fight its way. Science means the classification of knowledge, and the facts of sanitary science are well-grounded facts. The questions of sanitary science are of interest not to the medical profession alone, but to us all as citizens and parents. The speaker has exhibited this map on which he has indicated these privies by these black spots. They are black spots—the ugliest spots which are to be found in any community. There is nothing in civilization which so ties us to the Dark Ages as these spots. These privies are nearer to these wells than they ought to be. For 15 years this contamination of the ground has been going on. How far has this contamination travelled in this time? Fifty feet? Yes. Five hundred feet? Yes. Five thousand feet? Yes. How many such spots are there covering the subterranean lake under Vicksburg which supplies you with drinking water? With these improper conditions you do not get disease, because the disease germs have not been introduced. But the food which they require is here, and once introduce them into your vaults and they will multiply and reproduce.

Henry B. Baker, M. D., secretary of the State Board of Health, said that the way to remove the danger from the vault system was not to have any

Diagram, exhibiting a plat of the business part of the village of Vicksburg, showing the relation of privies to wells.



vaults. It is to be hoped that the board of health of Vicksburg will declare the vaults nuisances and adopt the dry-earth system, until you can secure sewerage. It is a universal law that the death-rate increases with the massing of the people, and this danger to the people of Vicksburg will constantly grow greater and greater as the population increases. The best system would be a sewerage system. By taking your water-supply from outside the town you could adopt the separate system of sewers; leaving the rainfall to flow off on the surface. This would first require a water-supply with which to flush the closets and sewers.

In response to a question as to the disinfectants to be used in the sick room (the general contents of the sick room cannot be disinfected while any living person is in the room), Dr. Baker read from the pamphlet issued by the Michigan State Board of Health, on the prevention of typhoid fever as follows:

"DISINFECT THE BOWEL DISCHARGES OF THE SICK.—This is a measure of prime importance. The discharges are believed to acquire more virulent properties after a few days, particularly when thrown, without disinfection, into a vault or other receptacle of decomposing filth. The bowel discharges should, therefore, in all cases, be received upon papers or old cloths and promptly burned, or be received in vessels and thoroughly disinfected as follows: Disinfect each discharge from the bowels by thoroughly mixing with it at least one ounce of chlorinated lime in powder, or one quart of 'Standard Solution No. 1,' recommended by the American Public Health Association's committee.* In country districts, villages and small cities, where the privy is not far distant from a well, discharges should not be thrown into a privy-vault, but, after being disinfected, they should be carried a greater distance from any source of drinking-water and then covered with earth.

"Rags, closet-paper, or other similar material used about the patient should be immediately burned."

These disinfectants could not be supplied by the State, as has been suggested, because they spoil by keeping, they deteriorate in their strength. We think the machinery is nearly perfect for securing prompt reports from, and constant communication with the local health authorities, and pamphlets are at once sent to the health officer stating just how disinfection is to be performed, etc. The law now makes the health officer liable to fine and imprisonment if he fails to attend to the disinfection, or to report promptly, and as a rule throughout the State very prompt reports are received. Enough of these pamphlets telling how to isolate patients and disinfect premises are sent for distribution to the neighbors of those sick, and they for their own safety are ready to insist on proper precautions being taken. These pamphlets will be distributed here this evening.

A. Arnold Clark, Lansing, said: The disposal of waste is not so much of a problem here now as it will be when you are more crowded. As Dr. Baker has said, these conditions become constantly more dangerous. "A thousand perils," said the Roman poet, "beset the great city." If you

* "Standard Solution No. 1," is made by adding to each gallon of soft water, four ounces of chloride of lime of the best quality, which should contain at least 25 per cent of available chlorine. "Use one quart of this solution for the disinfection of each discharge in cholera, typhoid fever, etc. Mix well and leave in vessel for at least one hour before throwing into privy-vault or water-closet."

allow these conditions to continue and let this waste stagnate in the soil until the earth has ceased to act as a filter, you may yet suffer some severe epidemic from this neglect. This digram which hangs before you shows that some of these wells are dangerous even now. There can be no doubt about it. That well 27 feet from that vault is not safe, and your local board of health should at once declare the whole vault system a nuisance and order it abated.

But what shall take the place of the vault? I think it is the conclusion of all who have studied the conditions here that you have splendid physical surroundings for a system of sewerage. It is estimated that for good sewerage there should be at least a fall of one foot in 92. You have a greater fall than that, and by introducing the Waring system of sewers, you could empty your sewage into the Portage with perfect safety to yourselves and without danger to the towns below. The pollution of rivers which has become so dangerous a problem for some cities is not a question here. It is a problem for Albany which derives its water-supply from the Hudson river after it has received the sewage of Troy. It is a problem for Providence, which derives its water-supply from a river passing through many manufacturing towns and which has recently suffered a severe outbreak of typhoid fever by the germs going from these manufacturing towns into its water-supply. It is a dangerous problem for Plymouth, Pa., which derives its water-supply from a mountain stream which four years ago became so contaminated with the germs of typhoid fever that one citizen in every eight in Plymouth was sick with that disease, and in a few weeks there were over one hundred deaths. It is so dangerous a question for some English cities that the pollution of rivers has been prohibited by law. One hundred English cities have adopted the irrigation system which has been spoken of today, and it is claimed that though the dejections from typhoid fever patients have thus been used the disease has not been communicated in this way. You remember how Victor Hugo in a rapture over the utilization of sewage cried out, "What is this garbage, this subterranean slime? It is the flowing meadow, it is the green grass, * * * it is perfumed hay, it is golden corn, it is health, it is joy, it is life." But whether or not it might not become under certain circumstances disease and death, whether or not the germs of disease deposited upon the soil might not continue to live, be eaten by men and produce disease, just how far they would be destroyed by the scavenger germs of putrefaction, just how far they would be oxidized, are questions not yet definitely settled.

However, there is no necessity for irrigation here, because you have such excellent conditions for the sewerage of your village without in any way polluting the water-supply of other towns.

Until a sewerage system is adopted here, I think there can be no difference of opinion as to what you should do. The vault system should be abolished and the dry-earth closet introduced in its place. The only objection to this system is that if it is not automatic and managed by the city it may be neglected. However, Birmingham, England, with 500,000 population has the dry-earth system and it is a success, because it is managed by the city. Until the dry-earth closet is generally introduced, boil the water you drink. Expeditions sent to study cholera have entirely escaped, with cholera all about them, because they took the precaution to boil the water they drank.

As the speaker has said, the greatest danger is not from that filth which accumulates upon the face of the earth, but from that which is hidden beneath. A great many complaints are received at the office of the State Board of Health of certain nuisances. I recollect one instance of a horse stable which was only twelve feet from a man's dining-room window, the manure pile was only three feet from the window and sixteen feet from the well. That man was not happy. He did not like to have his dinner flavored that way. He thought "of all the smells he ever smelled smell, he never smelled a smell smell as that smell smelled." Unquestionably that manure pile was a nuisance, but it is not so dangerous as the sparkling water swarming with the germs of disease.

Let me emphasize what has been said this afternoon, that your local board of health has it in its power to declare the vaults of Vicksburg a nuisance, to order them cleaned—disinfected with chloride of lime, and to establish the dry-earth closet system in their place. This has been done by some cities, and I hope that the Board of Health of Vicksburg will take this step before you are taught the lesson by such an epidemic as other cities have suffered.

Prof. V. C. Vaughan, M. D., member of the State Board of Health, said: It is a law applicable to all living beings up to man himself that his own excretions are poisonous to that being. Place a plant under a glass globe and it dies. The same is true of animals and of men. The question is, are you allowing this waste material to accumulate about your dwellings? If so, you are poisoning yourselves. In our new, thinly-settled communities we have not suffered so extensively as in the older communities. However, in 1880, though the average death-rate from typhoid fever in this country was 6.6 per 10,000 living, in New York city the death-rate was only 2 per 10,000. Among the farmers of Michigan it is 8.8 per 10,000. How shall we explain this? It is due to the fact that in the large cities more attention is given to the water-supply. There is a law in New York prohibiting the pollution of the Croton river. This gives a good water-supply. In Baltimore they have privies and there is no sewerage system. As a result the death-rate from typhoid is between 8 and 9 per 10,000 inhabitants. Cincinnati has practically no sewers, though much money has been spent in the effort to have them, and in Cincinnati the death-rate from typhoid is between 7 and 8 per 10,000.

In Munich in 1859 there were 269 deaths from typhoid fever. They had no public water-supply or sewerage. For every person who dies there are ten persons sick. Thus there were during the year 1859 in the city of Munich 2,690 persons sick with typhoid fever. Through the labors of one man, Max von Pettenkofer, Munich introduced a system of sewers, and the death-rate rapidly declined. Now the death-rate from typhoid fever is only .5 per 10,000. Typhoid fever is comparatively unknown.

In Michigan there are each year 1,000 deaths from typhoid fever, and if every man attended to the sanitary condition of his own premises there would not be a death from it. Think of the immense amount of money which these deaths cost the State and the family. All of us suffer—the State suffers from negligence and carelessness. We do not slander Provi-

dence any more by charging Him with this great loss of life. We are not so blasphemous. We say we are at fault, and it is the duty of every citizen to protect his own sanitary surroundings. If your neighbor knocks you on the head, a policeman would be after him at once; but your neighbor may pollute your well with filth and disease and you can do nothing.

Two hundred years ago the black plague broke out in Europe, and there were millions of deaths. But the black plague is now a disease of the past. Every death from typhoid fever is unnecessary, and the time will come when this disease, like the black plague, will be known only to history.

Dr. Arthur Hazlewood, member of the State Board of Health, gave an unwritten address on "Personal Hygiene."

Fourth Session—Friday, Dec. 6, at 7:30 P. M.

After music by a local glee club, Prof. F. S. Dewey of Alpena gave the following address on ventilation, and exhibited an apparatus to illustrate the subject:

VENTILATION.

BY PROF. F. S. DEWEY, ALPENA, MICH.

Some years ago it was proposed to erect a suitable monument to the memory of Roger Williams, the founder of Rhode Island, and to be sure of the locality his private burying ground was searched for the graves of himself and wife. Nothing could be found, however, except the rusted hinges and nails in one grave and a single lock of hair in the other; but an apple tree near by had sent down two roots, one of them making its way to the very spot where lay the skull of Roger Williams, underneath which it had made a turn and followed the spinal column down to the hips. Here it had divided, following the legs down to the heels, and even turning up at the toes. Those who had occupied the graves, even their bones, had disappeared. The guilty apple tree had done its work completely—had stolen the body of the sturdy founder of Rhode Island, and also that of his wife, had changed them into solid wood, into beautiful apple blossoms, and even into luscious fruit which from year to year had been gathered and eaten and relished.

We witness similar changes every day. We see a lovely carpet of grass and flowers which may be beauty today and beef tomorrow. The very elements of the brain out of which poetic inspiration may weave a garland for a queen today may tomorrow be exhaled upon the passing breeze and be absorbed by the weeds of the garden. Shakespeare was no less a philosopher than a poet when he makes Hamlet gravely tell the king that "man may fish with the worm that hath eat of a king, and eat of the fish that hath fed of the worm." Thus we find all through nature that life and death are constant companions, and oxygen which is the staff of the one is the scythe of the other. In its work of destruction it would bring every living thing to dust or ashes. While its mission seems to be to destroy, yet, deprived of

it, life will at once cease. We move a muscle and thousands of its particles are destroyed or worn out. The blood, freighted with oxygen, rushes in to repair the waste and carry away the ruins. In a dark, turbid stream it flows back to the heart and to the lungs, whence, with the oxygen, the impurities are exhaled in the form of carbonic acid gas. If there is any activity of the body or brain there will be a proportionate destruction of their elemental constituents. To repair this waste and to carry away the debris we must have a constant and liberal supply of oxygen. The only means by which we may obtain this oxygen is by a plentiful supply of fresh air, which, you know, is nearly twenty-two per cent pure oxygen. It is a well known fact that every creature, in fact every organized being in nature, is constantly sending off those elements which are most poisonous to itself. Man is no exception to the rule.

Ventilation has then for its object two things:

1. To get rid of death's ruins.
2. To supply life's needs.

In other words, ventilation must provide a means for forcing or coaxing away the foul and noxious gases accumulating in a building, and it must also provide a means of forcing or coaxing in an equal amount of fresh air freighted with life-giving, invigorating oxygen. As in most affairs of domestic economy coaxing is far more effective than forcing or driving, so it is in the matter of ventilation, and it is also far cheaper. To make an aperture through which fresh air may come in if it wants to and another through which foul air may go out if it wants to is sheer nonsense. Air never wants to do anything, and never will without coaxing or driving. A flue between the inner and the outer wall may let in a little fresh, cold air or it may let out a little foul air, but more often it does nothing or next to nothing at all. Air certainly cannot get out unless an equal amount comes in somewhere, nor can air, hot or cold, be coaxed or forced into a room without provision is made for letting an equal amount out. To coax in fresh air, then, and coax out foul air is all there is of ventilation. In coaxing it in it must be heated, it may and should be moistened, it should be evenly spread throughout the room, and there should be no sensible draft. In coaxing it out it must also be warmed or heated; in other words, the foul air exit pipe must have some portion of itself vertical and heated. It must be taken from that part of the room most highly freighted with foul emanations, that part occupied by the inmates, namely, the floor, and also to insure even distribution of fresh air and heat, it must be taken from several apertures, mostly distant from the inlet pipe. Now, it is well known that the more inmates there are in a room the less fire is required to warm that room, as each individual is in a certain sense a stove; consequently, if ventilation depends upon the amount of heat required to warm the room, there will always be the least ventilation where most is needed and the most where the least is needed. A school-room having a few pupils must have a large fire to warm it, while the room crowded with pupils needs but little fire. It is plain to be seen, then, that the amount of ventilation should depend not on the amount of fire, but on the will of the teacher. When a room is being heated in the morning, and before it is occupied, no ventilation at all is required. It is, to say the least, wasteful extravagance to heat and bring in fresh air merely for the purpose of turning it outdoors again. It is plain to see that this being done over and over again fifteen or twenty times

requires the use of a good many times as much fuel to warm it as is necessary. If the room is full of fresh, warm air there is no sense in turning that warm air outdoors again until it becomes to some extent foul. In other words, whether the room be heated by a stove or a furnace there ought to be some means of revolving the air of the room through or over the heater until it is thoroughly warmed; and there should also be a means of stopping this reheating and of turning this current, when it becomes foul air, off through a ventilating or exit pipe. The same movement should also open the fresh air inlet pipe. All this should be accomplished by a single movement of a button or lever, and should always be under the control of the teacher. Janitors are notoriously neglectful and stupid in these matters. They know as little of ventilation as they do of Greek, and usually care less, and furthermore most of the school rooms in Michigan have no janitors at all. Now what shall this apparatus be that shall, either by means of a stove or a furnace, heat the air of the room over and over again and then, at the will of the teacher, mix with this revolving current any amount of fresh air that may be desired, or carry it off as a corresponding amount of foul air. How can this be done so that each teacher for her own room, independent of all others, can have just what fresh air she needs and when she needs?

It is plain that she must be able to control three valves in three several pipes: one in the circulating pipe used in reheating the air of the room, one in the fresh air or inlet pipe, and one in the foul air or exit pipe. It is plain, too, that these valves must be all connected and operated simultaneously, otherwise there would be mistakes. It is also plain that when the circulating pipe is open the other two must be closed, and when the inlet and outlet pipes are open, or partly open, the circulating pipe will be shut, or partly shut. There is a bit of Arabic philosophy to the effect that he is the best teacher who is best able to turn ears into eyes.

Here is the apparatus itself in its simplest form, adapted to be used in a building with one room—a country school-house for example, with a common, cheap box stove. A candle shall be our stove, and this little enclosure shaped just like the school-house, with the peak cut off half way down to the eaves, and having a large door in the end, shall house in the stove. This, of Russia iron, with a loosely hanging skirt or lining inside to divide the incoming current, makes the stove, as you see, into an ordinary hot-air furnace. Now cut a large hole, about two feet square, through the floor in one corner of the room, and lead a pipe of the same capacity along under the floor and around that half of the room farthest from the stove. Cut a half dozen or more holes down through the floor into this pipe, which we will call the circulating pipe. Cover these exit holes with gratings, say common face plates. Now lead a pipe from outdoors to the same large hole in the floor in the corner, and also lead a branch from this circulating pipe to a ventilating flue or stack. As in most small buildings there is no ventilating flue or stack, make one, as here shown, out of sheet iron, the lower end reaching down through the floor into this branch of the circulating pipe, and the upper end reaching into the garret, or outdoors through the roof. This stack must be close against the end of the stove. Now set the stove over the large hole in the floor close up in the corner, house it in with the jacket, which must also enclose the ventilating stack, place valves properly connected in each of the three pipes, connect them with a small lever, whose upper extremity is in the room and handy for the teacher, set

a vessel of water on the stove, and we have the apparatus complete. The pipes being made of wood and lined with tar felt, may be cheap and capacious.

Now, in our model built exactly on this plan, ventilator, house and all, we will build a fire in the stove. The air about the stove inside the drum is rarified and rises, while the air descends through the gratings in the farther part of the room, rushes through the circulating tube to the stove to be heated, and thus all the air of the room is put into circulation. Now, as the smoke passes into this little school-house, you can see that the air in the upper half of the room is drifting *away* from the stove, that in the lower half drifting *towards* it, while that near the gratings is dropping down and rushing to the stove to be reheated. Now I will put in three lighted candles; the very short one is a little scholar, the next is a larger one, while the tall candle is the teacher. Now I will breathe in through an orifice in the side of the house. You see the little short fellow gets sick and dies first, and the taller fellow gets stupid and dull and dies next, and then the teacher, taller than the rest, stands head and shoulders for a while above the poison, but finally succumbs. This, you know, is no fancy picture. Intellects, warm and brilliant as these flames may be supposed to typify, are becoming stupid every day and frequently fade and die, and that within the observation of all. Pale cheeks and dreamy eyes and puny forms in school are caused not by overwork but by foul air.

Now I will bring the dead to life: that is, relight the candles, and I will also move the lever a trifle. This movement has now closed the circulating pipe and opened the fresh air pipe and foul air flue. Now the air comes in fresh from outdoors, rises under the stove, is heated inside the drum, the current is divided so that some comes in cool and mixes with the hot air just at the top of the drum, is moistened and enters the room without any sensible draft, while the foul air descends through the registers and is carried off through the heated ventilating shaft. By moving the lever only part way the inlet and outlet pipes are only partly opened and the circulating pipe is only partly closed, thus furnishing the conditions required for fewer pupils, or a hotter fire, or a very windy day.

If now I breathe into this house, the foul air is immediately carried away and the pupils and teacher no longer fade away and die as before. They are now getting plenty of fresh air, plenty of oxygen for vigorous work. As smoke passes into the house you see how quickly it is hurried down through the registers in large streams and pours out of the top of the ventilating stack.

As a hot air furnace is nothing more than a stove placed in the basement and housed in, the working is the same.

The stove, being close in the corner, takes up very little room, and, as it is surrounded by a double jacket, pupils seated two feet from the stove are no whit warmer than those twenty or thirty feet away. Indeed, the farthest are usually found to be the warmest. As no part of the room is superheated, there is a saving of fuel and an even temperature all over the room; no favorite seats, no freezing, no frying, no foul gases, but pure air, the best medicine ever God gave to suffering innocence.

F. S. Coller, M. D., of Vicksburg then presented the following paper on the water-supply of Vicksburg:

THE WATER-SUPPLY OF VICKSBURG.

BY F. S. COLLER, M. D., VICKSBURG.

I am sorry to say that my subject has resulted somewhat uninteresting to me, not that I take no interest in this branch of sanitary science, for I have seen no longer ago than this fall one death and some terrible sickness which Dr. McKain and I could readily trace to the foul condition of wells. But in undertaking to analyze some samples of water from wells in our village, my subject became uninteresting because I could find no fault, which is my principal forte. However, I well understood before I began, that Vicksburg was supplied with excellent drinking water, which is a blessing to any community, and thus I found it. With two or three exceptions I am positive that every well supplies to its owner a good palatable water. There is, however, a great variety of flavors among them. The flavor of water has little bearing on its sanitary quality. The flavor may be high and the appearance unwholesome, yet the water may not contain any disease germs. I do not mean to say by this that a bad tasting water is a good water for domestic purposes, nor by any means that a water clear and palatable is a pure and sanitary water. For a great many very injurious substances may exist in water that looks the best.

In one sample which I procured from a blacksmith's well I found no ingredient which could harm the system, and at the same time the well, I considered, was in a bad situation. The horses that were being shod stood not more than ten feet from the well. Of course more or less of their excreta being absorbed at that distance would be very likely to percolate into the well. Also, there were two privies near, one about fifty and the other sixty feet away, and a manure pile at the end of the shop, probably twenty-five feet away. In this sample I found no excess of organic matter or solids, the chlorine being a little in excess. The excess of chlorine was not sufficient to make it anyway suspicious.

Another sample I obtained from our high school well, which is 129 feet from the three privies in the back of the school yard. Here I would like to state for the good of our community—if the author of the paper on this subject will excuse my intrusion—that our school privies are in a bad condition, and I would recommend here that the school board see to it that some hard substance be used for a floor, either stone or cement, which I think would relieve them of their disagreeable odor. In their present condition they are not fit for any being that breathes to go into. In this sample of water I found a moderate quantity of inorganic mater, making the water very hard and difficult to lather with soap. None of the other constituents of water were in excess.

Among other samples of which I made a sanitary analysis, I found nothing that would make them otherwise than a good drinking water. One sample, which was brought to me by one of our citizens, I found to contain a slight excess of organic matter, but he soon drove his well deeper, with a favorable result.

I obtained during the month of October a sample of water which was suspected of having iron or sulphur in it. It was a drive well 15 ft. deep, and put down at the edge of a large marsh. This marsh had been dry all summer. The water was of a rich yellow color, with an odor of sulphides and traces of nitric acid, with chlorine entirely absent, and an uncommonly large quantity of organic matter, and no inorganic substances. There was undoubtedly an excess of vegetable organic matter, and perhaps the organic matter was entirely vegetable, as indicated by a lack of chlorine. In the annual report of the National Board of Health, Dr. Chas. Smart, Surgeon U. S. A., says: "In a contaminated water, when the chlorine figure is large, an animal derivation is probable, while with the chlorine figure small, a preponderance of matter of vegetable origin is almost certain."

The idea that the water possessed any mineral qualities probably arose from the fact that the water was highly colored, but this color was derived from the excess of organic matter, as no mineral substances were present. This water was decidedly foul and unfit for use by human beings, and I doubt the propriety of giving it to the lower class of beings.

In this connection I will give the history of two contaminated water supplies that came to light in Dr. McKain's practice during the fall, which were not in our village. They will undoubtedly prove as interesting and profitable a lesson as they would if occurring in our midst, for all the hints thrown out in this convention respecting the cause and prevention of disease should be closely noted, that care may be taken in the future that no such carelessness is found in our now comparatively healthy village.

In one instance I have in view, where a severe fever occurred, the young lady of the family first taken sick died from a severe ulceration of the bowels, resembling very much typhoid fever. During her illness the whole family were troubled with the same symptoms that preceded her illness. These general symptoms led to an investigation, which disclosed the following conditions: It was found that their well, which was an ordinary drive pump, had during the previous winter been packed with straw around the valve to keep it from freezing, and in the spring the edges of the hole caved in so that the straw was covered up, allowing it to rot. This caused a foul discharge to constantly flow into the well, causing an extensive contamination of the water.

In the other family, who resided in the same vicinity, the oldest girl had been tending the deceased girl spoken of above. She was also taken sick in the same manner, possibly started by the same cause, her case nearly proving fatal. About the same time that she was coming down nearly the whole family were taken sick, all complaining of the same trouble with bowels and fever, which was severe in nature. On investigating this case it was found that their well, which had been curbed with wood, was some time ago bricked up, and the wooden curb removed, with the exception of a few feet in the bottom of the well. This being left, the brick was put inside and the space between the two curbs filled with dirt. At the time of their sickness this wooden curbing was found to be rotten, and a green slime and toad-stools (so called) grew out on the brick and dropped into the water, causing at least a very unwholesome appearance. However, I understand the water was very palatable and clear. No samples of these waters were procured for analysis, I am sorry to say, but they would undoubtedly have

yielded an abundance of poisonous material. The circumstantial evidence was strongly against them, to say the least.

Returning to some of the conditions in our village respecting proximity of privies, barns and wells, there is one place around the buildings on Prairie street where there are wells with privies not more than ten feet distant, and one well with two privies, one each side, not farther than ten feet away. There are also barns that are far inside the allowed limit. Now here is a condition of things that I fear will some day prove very disastrous. Any day—we know not what day—the filth from these vaults may find its way into these wells, and then may occur some disease which could be easily prevented by removal of either the privies or wells. It will undoubtedly be admitted by all within my hearing that a bath at least once a week is excellent for the health; yet they say that some people have lived three score and ten years and never allowed a drop of water to touch their skin below their collar. Like these few remarkable people who have lived contrary to hygienic laws all their lives, a person may take into his alimentary canal for a series of years this water and never be harmed. Yet let me remind you of the fact that grim death may some day sit upon the edge of his water pail unbeknown to him, until it is to late too remedy his havoc.

A person's first introduction to our village would give him the idea that we were in an unfavorable situation to procure any drainage whatever. I know this was my first impression and I have heard many make this remark. But by investigation it will be found that we already have a good natural surface drainage, as we are above our leading stream of water a sufficient distance to produce it. At any time in the future when a system of sewerage is needed, it can be easily obtained by emptying the sewage into this stream, the incline, I think, being sufficient from all parts of town.

Our pond has apparently no effect on wells in its vicinity. There exists in these wells, as in others, a good quality of water. The pond is in fairly good condition, although not fit for drinking water by any means. I have some specimens of vegetable life here which I prepared for the microscope, and, through the kindness of Dr. Scott, I have some of the specimens enlarged. These drawings do not show the beautiful lines and colors which exist in the specimens when looked at through the microscope, and, after the close of this session, those who wish may see them. By glancing at the enlarged specimens one can more readily pick out the little forms under the microscope. These forms adhered to some weeds I obtained from the pond during the month of October. It was very cold at the time and they consequently had very little life, but by keeping them warm and moist new forms were soon hatched out. I will not undertake to name these or explain their mode of living, any further than to state that they are a vegetable form of life, grow and thrive in such waters as our pond water, multiply by dividing, and their multiplication is very rapid. You would imagine that they would tickle the palate when swallowed, but millions of them could pass down the throat in one glass of water and not be noticed. In the specimens I have prepared for the microscope I use only a part of a drop of water and in this small amount I have hundreds of them, which shows that their structure is very minute, and requires the enlarging power of the microscope to be at least four or five hundred diameters to distinguish their delicate structure.

In regard to a future water-supply, I think our village is in need of it for more reasons than one. Our soil is fast becoming contaminated with the accumulation of waste products, as manure piles, old privy vaults which have been covered up and others that will soon have to be covered, and with all the waste products that result from an accumulation of many people over small territory of ground. Although the result has not shown itself, yet in the future it is inevitable. The ground will cease to become a good filter when it is loaded with filth itself. It will become necessary to establish a system of sewerage which cannot be accomplished to any advantage in any town without a perfect system of water-works by which the sewers can be flushed, for soon any system of sewerage will become so clogged with the waste of a town that its current will cease to flow if it is flushed only by the rainfall. Not only should these advantages prompt our people to make an effort to obtain a system of water-works, but there is also the advantage of protection from fire as well as the protection to our lawns in summer.

The first step is to procure a good supply of wholesome water. This could be done undoubtedly by boring a deep well, which has been done in numerous parts of the State. They even get a flow of pure and palatable water which rises above the surface of the earth. There is no body of water here that would be suitable for a supply, and therefore it would be necessary to procure it from wells, and as the flow of water is in a southerly direction, this being the north side of St. Joe river valley, it would be proper to bore for water north of the village to prevent any percolation of sewage into the well, as the flow of waste is in the same direction as the water flow. Putting down an artesian well so that it would furnish a steady stream of water at least six inches in diameter, would furnish to our village a free and sufficient supply of water. I should recommend that a small pump be used and combined with a standpipe, which will keep up a steady pressure on the pipes. The expense need not be great. As to a position for a well, I can find none that would compare with the grounds north of the pond and just west of the Grand Rapids & Indiana railroad. This would promise for years a well that could not be contaminated by cesspools and vaults, as probably no building would take place around it for some time. The health of a community depends largely upon the purity of the water-supply. A pure water may be defined as one which is unobjectionable for domestic uses and especially one that may be used with safety as a drinking water. For persons affected with kidney troubles, distilled water is very beneficial as a beverage, as it acts as a powerful solvent in the removal of waste products of the body. Professor Chas. Mayr says: "Persons who never drink pure water never know what a good effect it has on the kidneys. Its effect is better than any diuretic, and is the best remedy for renal diseases known. Of the numberless waste products of the body it is known that many of them require pure water for their solution, and water loaded with salts when taken into the system cannot have this necessary effect.

The healthy human system requires mild cathartic and other mineral salts for the continuity of health. These in part can be furnished to the system as the mineral constituents of potable water. The wholesomeness of water is therefore increased by the presence of small quantities of certain salts, which act as cathartics and aid in developing animal tissue. Dr. H. Letheby, an eminent English chemist and sanitarian, concluded from his

investigations that the rate of mortality was inversely as the amount of mineral salts in the water-supplies. A water which contains an over amount of mineral constituents should be avoided, as it will produce derangements of the alimentary canal.

When the amount of mineral becomes extensive it is styled mineral or abnormal water. They are classified according to their principal substances in solution. Thus, a chalybeat water has an excess of iron in solution, usually carbonate or sulphate, and which, upon standing exposed to the air, generally deposits a yellow precipitate of carbonate of iron. A saline water has an excess of salt like sodium chloride or sodium and magnesium sulphate. A carbonated or acidulous water has an excess of carbonic anhydrid, while a sulphurous or hepatic water contains an excess of hydrogen sulphide, and upon standing a hepatic water will deposit sulphur.

Mineral waters, when used moderately, are sometimes beneficial to health, owing in part to the cathartic action of the alkaline salts. Saline waters are beneficial to persons complaining of rheumatism. Water containing much hydrogen sulphide will produce diarrhea if combined with organic matter in small quantities. It is not in any way dangerous to health. Some salts are productive of indigestion, while others, as chalybeat waters, often produce headache, indigestion and dyspepsia. A drinking water should contain no more than one-fifth of a grain of iron in a gallon. The goiter, among the inhabitants of the valleys of Switzerland, is caused by excess of salts in their drinking water.

With regard to total impurities in drinking water, the sanitary congress at Brussels decided that over 35 grains of impurities in one gallon was unwholesome, while not more than one grain of organic matter is admissible in a gallon of water. The salts of some elements, like arsenic, antimony, barium, copper and lead, are dangerous poisons, and water containing them, even in traces, should be avoided. Lead poisoning in cities is not infrequent when the water for domestic purposes passes through lead pipes. It is doubtful whether lead pipes should be used at all for a water-supply, as a water which is so loaded with salts as to prevent the solution of lead pipes is liable to produce disarrangements of the alimentary canal.

It is also believed that water turbid with sand and clay is productive of intestinal difficulties, indigestion, dyspepsia and diarrhea. The turbidity of water is sometimes produced by decomposing organic matter, which is, with the exception of pathogenic germs, the most deleterious of all ingredients.

Fresh vegetable matter easily undergoes decomposition, giving rise to gaseous products which may produce malarial diseases, whether in air or water, but diseases caused by a contaminated water are usually more severe than those caused by air impurities. By drainage and cultivation the communities where malaria raged have been freed almost entirely from it. Many cases are on record in our late war where a severe diarrhea was caused by vegetable contamination of water, which disappeared by filtration of the water.

The products of decomposition of animal matter are always dangerous to the human system, and water which is contaminated with the animal accumulation of sewers, cesspools and privies is most loathsome and dangerous. Animal matter is highly putrescible and water containing it is likely to produce putrefactive change in the person drinking it. The nitrogenous matter is decomposed by oxidation, and, by disintegration through the agency

of micro-organisms, "ptomaines" are produced. Although the ptomaines are present in very small quantities in polluted water, yet they are very active in their physiological effects, and produce dangerous results when taken into the system. Other products of decomposition furnish a suitable pabulum for the growth and multiplication of germs of disease, and zymotic fevers are often spread through the water we drink. Such waters are often deceptive, since they generally have an agreeable taste and are highly palatable. There is abundant proof that drinking water has been the cause of spreading the following diseases: Cholera, typhoid fever, dysentery, diarrhea, diphtheria, malaria, cholera infantum and cerebro-spinal meningitis, also low forms of fever, to which no name but fever can be given.

In the city of Vienna from 1851 to 1874, while impure well-water and a supply from the Danube were used, the annual death-rate from typhoid fever was from 100 to 300 per 100,000 inhabitants. By the use of spring-water in place of the former supply the mortality was reduced greatly. During the last three years the annual death-rate in that city has only reached 11 in 100,000 inhabitants.

Living germs are more dangerous in drinking water than dead organic matter; many diseases, such as typhoid fever, diphtheria and cholera, are supposed to be caused by these micro-organisms. Being thrown off with the excretions of the sick, they find their way mainly through water-supplies to those who, from predisposing causes, are in a condition for their reception and multiplication. These pathogenic germs are known as bacteria, and the diseases are called zymotic, in consequence of their course resembling a process of fermentation. These germs are capable of being carried long distances in water without losing their vitality necessary to produce disease. Thus the dejections of a single typhoid case may be sufficient to produce a poisoning of the whole water-supply of a village and cause an extended outbreak of fever. Pasteur has shown that bacteria will not thrive without a putrefactive environment, but remain infertile until they perish. These germs only thrive in a neutral or alkaline substance, so in the healthy human system they do not thrive, as the reaction therein is acid; but a person afflicted with digestive disorders, in which the gastric juice is restrained, affords a fertile field for their multiplication. A good corrective for alkaline polluted water is sulphuric acid, as it arrests putrefaction and kills germs. Sulphuric acid is also used successfully in treatment of cholera and typhoid fever, from the fact that it is a powerful germicide.

Rain water is supposed by many to be perfectly free from impurities as it falls, but the first fall of rain after a drouth is swarming with living organisms washed from the air. Even the purest air contains myriads of motes, which can be seen by the naked eye in the sunbeams. The British River Pollution Commissioners concluded that "half a pint of rain water often condenses out of about 3,373 cubic feet of air; and thus in drinking a tumbler of such water, impurities, which would only gain access to the lungs in about eight days, are swallowed at once." These impurities consist of ammoniacal salts, nitrous acid, nitric acid, sodium chloride, calcium compounds and organic matter; and when the water has drained from the roofs of buildings, after a dry season, the additional impurities consist of dirt, dead insects, excreta of birds, and probably dried disease germs. Rain water has usually a flat, smoky taste, caused by the absence of carbonic anhydride and alkaline salts.

To collect water for drinking purposes, it is necessary to have a cistern with walls that will not admit of leakage from privies and cesspools, and the water should be filtered through sand and charcoal before being admitted to the cistern. This makes a wholesome water for drinking purposes.

The purity of well water depends mainly upon the depth and situation of the well and surrounding soil. Deep wells, when properly made, are generally free from organic impurities, but their waters are impregnated with hardening salts. Artesian well water is also free from organic matter, but it is usually highly mineral. Deep well waters are not best suited to the digestive powers of man, and every intelligent groom and herdsman knows that such waters are also more prejudicial to horses and cattle than the water of a muddy stream. The abundance of filth in cities renders the soil unfit for filtering purposes, and surface wells in such soil furnish only polluted and dangerous water. Wells are often situated too close to dwellings, cess-pools, stables, and privy vaults, and thus become contaminated. There should at least be a distance of one hundred and fifty feet between our sources of water-supplies and storages for water products. As scientific views concerning the pollution of well waters are disseminated, surface wells are being rapidly abandoned by the intelligent classes.

The ordinary methods of bricking or walling wells afford no protection against surface drainage. Open wells should be walled with hydraulic cement above water line to prevent the admission of filth. Surface contaminations are also prevented by the use of drive wells. With these the only pollution comes from the downward circulating currents. Wooden curbs for wells are also a serious source of danger, as the wood soon becomes rotten and promotes the growth of fungi.

Springs are fountains of water which flow from subterranean channels,—not these holes you find along the edge of marshes where water oozes out slowly, with no visible flow. Spring water is a filtered water, but this does not necessarily destroy any disease germs that may be present. Spring water which flows from mountain sides is generally cold and of uniform temperature the year around. Average porous soil contains about two hundred and fifty times as much carbonic anhydride as does air, and this is taken into the percolating water as it filters into the subterranean channels, thus rendering the water especially palatable. The carbonic anhydride dissolves limestone, which renders the water hard; generally carbonates of lime and magnesium are the hardening salts.

Lastly, river and lake water is not fit for drinking purposes unless thoroughly filtered. Such water is always open to receive all the filth the earth affords. For city supplies, water, if taken from the rivers, should be drawn from a very high point in its course, so as to shut out as much as possible the sources of contamination, and this water should be filtered before being used for drinking water.

Small lakes are usually receptacles for such water as is found in the streams, and consequently is of no higher grade. Such large bodies generally keep cooler during the hot summer and become somewhat purer during the winter by the sedimentation of their suspended matter.

DISCUSSION OF WATER-SUPPLY.

BY PROF. V. C. VAUGHAN, M. D., PH. D., MEMBER OF THE STATE BOARD OF HEALTH, ANN ARBOR.

[Reporter's Abstract.]

I am glad to learn that your water is at present so good and that you are comparatively free from those diseases commonly spread through the water-supply, but let me assure you that with your wells no deeper than they are now and with increasing cess-pools, as your city grows older, it is only a question of time when you will suffer. The Athenians believed at the time of the plague that their water-supply had been poisoned. They claimed the same thing some time ago in Plymouth, Pa. They were right, but no enemy by night had poisoned their wells with strychnine, but the people themselves, by their own excretions, had poisoned their water-supply.

Let us for a moment consider cholera. To do this it is necessary to go to India, "the birthplace and permanent abiding place of cholera." These epidemics of cholera have their origin in connection with the Indian festivals. "Each year twenty-four high festivals take place at Juggernaut. For weeks before the car festival in June and July, pilgrims come trooping in by thousands every day. The food which they eat must first be presented before Juggernaut, and thus becoming too sacred to be thrown away it putrifies under the great heat and becomes unfit for human food. But if they are badly fed they are worse lodged. They are housed in hovels built upon mud platforms about four feet high, in the center of each of which is the hole which receives the ordure of the household, and around which the inmates eat and sleep. The platforms are covered with small cells, without any apertures for ventilation, and in these caves the pilgrims are packed. Of the 300,000 who visit Juggernaut in one season, 90,000 are often packed together for a week in 5,000 of these lodgings." You possibly have heard of the lady in London who went among the east-end Arabs and found two deserted children ten or twelve years of age. She took them home, washed them and took them to a large bedroom to sleep. Actuated by curiosity, she afterwards went to the room, but found the bed untouched. After a diligent search they were found asleep on a shelf in the closet. They had looked around and the closet looked the most like their ordinary sleeping abode of anything they could find. This is the way the Hindoos sleep, and when they are crowded together in this way the cholera invariably breaks out. Now, these people store their rain water in tanks (small surface reservoirs). They drink the water from these tanks, wash in it, bathe in it, and the clothes of the cholera patients are washed in these tanks out of which the people drink. In 1883 cholera traveled as far as Marseilles. Genoa spent much money in cleaning the streets, and it seemed that the inhabitants would be rewarded with success, but suddenly cholera appeared in Genoa, not in dens of filth, but in the palaces of the rich. Cholera appeared only in those houses supplied by one of five different water companies. The water came from a reservoir thirty miles out of town. A new reservoir had recently been dug. Among the laborers in this reservoir some were suffering with cholera and the dejections were thrown into the pit. The company was ordered at once to cut off the

water-supply from this reservoir and cholera disappeared. Other examples might be given where cholera has been carried through the water-supply. It is probably not carried through the air, because when the germ is dried its vitality is largely reduced. Possibly the germs of cholera may be introduced into the stomach and yet the person will not contract the disease, because the healthy gastric juice may kill the germs.

But we have probably seen the last of cholera in this country. Typhoid fever destroys more citizens of the United States every year than cholera has destroyed in the last fifty years. In the United States 40,000 die from it every year, and there are sick with it 400,000. This means a money loss to the community of forty million dollars every year. Suppose some foreign foe would rob us every year of forty million dollars, we would be up in arms. There would no longer be any trouble with the surplus; we would expend it righting our wrongs. But what is government doing today? While every other government has a National Board of Health, ours has none. Every shore has its lighthouses; we spend millions of dollars for the study of meteorological conditions and the diseases of animals. The United States has spent more money in the investigation of hog cholera than it has in the study of any of the diseases which man is heir to.

In our disposal of waste we are not much better than the heathen Hindoo. Dr. Kilvington, of Minneapolis, gives the following figures: The Mississippi river in 1888 received the sewage of eight of our largest cities—152,675 tons of garbage, 108,250 tons of excreta and 3,765 dead animals. The Ohio river receives the sewage of five cities, 21,157 tons of excreta, 5,100 dead animals; and the same cities received their water-supplies from this river. The Missouri river received 22,400 tons of excreta, 31,169 dead animals, and 36,110 tons of garbage. Not only are we polluting our large but our small streams and our wells. In Coldwater, in this State, the slope of the ground is from east to west, there is a layer of gravel from 12 to 15 feet, and under it an impervious bed of clay. The wells and privies are both down in the gravel, and they wonder that they constantly have typhoid fever. We had a sanitary convention there some time ago and told them about their danger, but they continued to drink this water, and typhoid is still reported. Negaunee, in this State, is largely owned by capitalists, and is inhabited by Finns, Polanders, and Norwegians. The owners live in Cleveland. The water-supply is received from Teal Lake, where their offal is dumped, and this year they have had three or four hundred cases of typhoid fever. There should be some law prohibiting the pollution of water, as there is a law punishing poisoning.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING, MICHIGAN.

In Michigan the most dangerous communicable diseases, named in the order of their importance, are: Consumption, diphtheria, typhoid fever and scarlet fever.* In recent years small-pox is not one of the most dangerous diseases to the people of Michigan as a whole, although of course it is dangerous to any unvaccinnated person. Small-pox does not now cause as many deaths in Michigan as does whooping-cough; but this is probably in great part due to the intelligence and teachableness of our people who are comparatively easily influenced to promptly vaccinate and revaccinate on the occurrence of that loathsome disease. On account of these facts and because small-pox is, in the public mind, a typical dangerous communicable disease, a few words may well be devoted to small-pox, especially as I want to use that disease as a measuring rod by which to judge the extent of the more dangerous diseases.

SMALL-POX.

The great *preventive* of small-pox is vaccination and revaccination; and every person, for his own safety, and to prevent liability to interference with his business through his own sickness from small-pox, should be revaccinated about once in five years.

For the *restriction* of small-pox it is essential:

1. That the local health officer shall have notice of the occurrence of a case as promptly as possible. He should have notice about as promptly as the fire department has of the occurrence of a fire.
2. The local health officer should promptly isolate all infected persons and things, and keep them isolated until freed from infection.
3. The local health officer should order the prompt vaccination or revaccination of all persons not recently vaccinated, or who have not recently had the small-pox.
4. The local health officer should have continued supervision of every case of small-pox until complete recovery or death.
5. After death or recovery of the patient, the local health officer should thoroughly disinfect all infected premises and things.

This is a brief summary of how small-pox may be prevented, and restricted in cases where preventive measures have not been completely carried out. Full details of vaccination and of all particulars for the management of an outbreak of small-pox are published in pamphlet form by the Michigan State Board of Health, and copies of that pamphlet are here for distribution to such of you as may wish for it.

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* See diagram on page 28.

Some of you may ask: "How do you know that small-pox is or can be prevented and restricted in the ways pointed out in the pamphlet?" We knew it before the pamphlet was issued because of facts collected in other countries, but we now know it because the statistics collected and published by the Secretary of State of Michigan, taken in connection with the facts on record in the office of the State Board of Health, prove that in Michigan, through such measures as I have outlined, the mortality from small-pox has been reduced, and that if it had continued at the same rate as before the State Board of Health was established, more than one thousand five hundred persons in Michigan *would* have died from small-pox that have *not* died of that disease.* This was true at the end of the year 1887, and since that time the mortality from small-pox in Michigan has not increased. The statistics now cover so many years that we think there can be no doubt of the reliability of their evidence.

Life Saving in Michigan, from Small-pox.

TABLE 1.—*Deaths from Small-pox reported to the Secretary of State as having occurred in Michigan during the five years 1869–73, compared with the fourteen years 1874–87; 1873 being the year, in the latter part of which the Michigan State Board of Health was established and began its work. Also a comparison for the four years 1874–77 with the ten years 1878–87; the Document on the Restriction and Prevention of Small-pox having been issued by the State Board of Health in 1878, and distributed each year since that date.—Showing decreasing numbers of deaths in a population known to be increasing.*

Years. (Five.)	Deaths.	Years. (Fourteen.)	Deaths.	Years. (Four.)	Deaths.	Years. (Ten.)	Deaths.
1869	42	1874	18	1874	18	1878	6
1870	9	1875	26	1875	26	1879	6
1871	78	1876	76	1876	76	1880	3
1872	302	1877	102	1877	102	1881	82
1873	90	1878	6			1882	100
		1879	6			1883	5
		1880	3			1884	3
		1881	82			1885	3
		1882	100			1886	6
		1883	5			1887	0
		1884	3				
		1885	3				
		1886	6				
		1887	0				
Sums	516	.....	436	.....	222	.....	214
Averages ..	103	.....	31	.....	56	.....	21

* This is shown on page 56, in last column of Exhibit 1, third line from the bottom of the table.

EXHIBIT 1.—*A comparison of the deaths from Small-pox reported to the Secretary of State as having occurred in Michigan during the five years (1869-73) preceding the organization of the State Board of Health, with the four years (1874-77) immediately succeeding its organization, and those four years (1874-77) with the seven years (1878-84) during which the Document on the Prevention of Small-pox was distributed; also the five years (1869-73), just before the Board was established, with the seven years (1878-84) during the use of the Document, with the eleven years (1874-84) after the organization of the Board, and with the ten years (1878-87) during the use of the Document; and finally a comparison of the five years (1869-73) just preceding the work of the Board, with the fourteen years (1874-87) since the State Board of Health was established.—Showing a progressive decrease of deaths per 100,000 inhabitants.*

Periods of Time Compared.	Estimated Average Population.	Average Deaths Reported per Year.	Total Deaths Reported.	Average Deaths Reported per Year per 100,000 Inhabitants.	Decrease of Deaths per Year per 100,000 Inhabitants.	Average Decrease of Reported Deaths per Year.†	Lives Saved during the Period, according to the Reports.*†
5 years, 1869-73....	1,215,220	103	516	8.48			
4 years, 1874-77....	1,409,758	56	222	3.97	4.51	64	256
4 years, 1874-77....	1,409,758	56	222	3.97			
7 years, 1878-84....	1,696,084	29	205	1.71	2.26	38	266
5 years, 1869-73...	1,215,220	103	516	8.48			
11 years, 1874-84...	1,609,023	39	427	2.42	6.06	98	1,073
5 years, 1869-73...	1,215,220	103	516	8.48			
14 years, 1874-87...	1,670,669	31	436	1.86	6.62	111	1,554
5 years, 1869-73....	1,215,220	103	516	8.48			
7 years, 1878-84....	1,696,084	29	205	1.71	6.77	115	806
5 years, 1869-73...	1,215,220	103	516	8.48			
10 years, 1878-87...	1,775,084	21	214	1.18	7.30	130	1,300

* Probably not all deaths were reported before or since the organization of the Board, consequently the saving is probably greater than is here shown.
† Allowing for increase of population.

SCARLET FEVER.

In Michigan, scarlet fever causes about nine times as many deaths as small-pox does. Unfortunately we do not yet yet know of any preventive *vaccination* or *inoculation* for scarlet fever. The only *preventive* is to keep away from the disease, and to allow no person or article infected with the scarlet fever contagium to come near a person susceptible to that disease.

For its restriction, except that there is no vaccination, all the measures proper in the case of small-pox are proper in scarlet fever.

Inasmuch as scarlet fever causes nine times as many deaths as small-pox does, the importance of prompt notice to the health officer is at least nine times as great as it is in small-pox.

All the other measures should be promptly and thoroughly executed. I will not stop to give you details. They are published in our pamphlets here for distribution.

At the close of the year 1887, the statistics of the State Department, heretofore mentioned, showed that the mortality from scarlet fever in Michigan had been reduced in the years when the measures recommended by the State Board of Health had been to some extent fulfilled, so that over five thousand six hundred persons had lived who under the old mortality rate, before the Board began its work, would have prematurely died.* This

* This is shown on page 58, in last column of Exhibit 2, second line from bottom of the table.

is an average saving of four hundred lives per year—rather more than a life every day for fourteen years—saved from that dread disease, scarlet fever.

But we have other evidence than the mortality statistics, showing the great saving of life which it is possible to have in Michigan through such measures for the restriction of scarlet fever as I have briefly outlined. The experience of the local health officers in restricting scarlet fever in this State is reported each year to the State Board of Health; and a compilation of these reports shows that in those outbreaks in which isolation and disinfection were neglected there were about five times as many cases and about five times as many deaths as in those outbreaks in which they were enforced.*

This is about equivalent to saying that four-fifths of the cases and deaths from scarlet fever are known to be preventable through measures which we can describe in three words—*isolation and disinfection.*

Life Saving in Michigan, from Scarlet Fever.

TABLE 2.—*Deaths from Scarlet Fever, reported to the Secretary of State, as having occurred in Michigan during the five years, 1869-73, compared with the fourteen years, 1874-87; 1873 being the year in the latter part of which the Michigan State Board of Health was established and began its work. Also a comparison of the three years 1874-6, with the eleven years, 1877-87,—the Document on the Restriction and Prevention of Scarlet Fever having been issued by the State Board of Health in 1877, and distributed each year since that date.—Showing decreasing numbers of deaths in a population known to be increasing.*

Years. (Five.)	Deaths.	Years. (Fourteen.)	Deaths.	Years. (Three.)	Deaths.	Years. (Eleven.)	Deaths.
1869	252	1874	440	1874	440	1877	404
1870	852	1875	423	1875	423	1878	429
1871	696	1876	399	1876	399	1879	418
1872	565	1877	404			1880	370
1873	580	1878	429			1881	383
		1879	418			1882	592
		1880	370			1883	673
		1881	383			1884	326
		1882	592			1885	245
		1883	673			1886	319
		1884	326			1887	318
		1885	245				
		1886	319				
		1887	318				
Sums.....	2,945	.....	5,739	.....	1,262	.....	4,477
Averages.	589	.....	410	.....	421	.....	407

* The evidence for one year, 1888, is shown in the diagram on page 59.

EXHIBIT 2.—*A comparison of the Deaths from Scarlet Fever, reported to the Secretary of State as having occurred in Michigan during the five years (1869-73) just preceding the organization of the State Board of Health, with the three years (1874-76) immediately succeeding its organization, and those three years (1874-76) with the eight years (1877-84), during which the Document on Restriction of Scarlet Fever was distributed; also the five years (1869-73) just before the establishment of the Board with the eight years (1877-84) and the eleven years (1877-87) during the use of the document; and finally a comparison of the five years (1869-73) just preceding the work of the Board, with the eleven years (1874-84) and the fourteen years (1874-87) since the State Board of Health was established.—Showing a progressive decrease of deaths per 10,000 inhabitants.*

Periods of Time Compared.	Estimated Average Population.	Average Deaths Reported per year.	Total Reported Deaths.	Average Reported Deaths per Year per 10,000 Inhabitants.	Decrease of Deaths per Year per 10,000 Inhabitants.	Average Decrease of Reported Deaths per year.†	Lives Probably Saved, according to the Reports.*†
5 years, 1869-73	1,215,220	589	2,945	4.85			
3 years, 1874-76	1,384,515	421	1,263	3.04	1.81	252	756
3 years, 1874-76	1,384,515	421	1,263	3.04			
8 years, 1877-84	1,689,988	449	3,595	2.66	.38	64	512
5 years, 1869-73	1,215,220	589	2,945	4.85			
11 years, 1874-84	1,609,023	442	4,857	2.75	2.10	338	3,718
5 years, 1869-73	1,215,220	589	2,945	4.85			
8 years, 1877-84	1,689,988	449	3,595	2.66	2.19	370	2,961
5 years, 1869-73	1,215,220	589	2,945	4.85			
14 years, 1874-87	1,670,669	410	5,739	2.45	2.40	401	5,614
5 years, 1869-73	1,215,220	589	2,945	4.85			
11 years, 1877-87	1,748,712	407	4,477	2.33	2.52	441	4,851

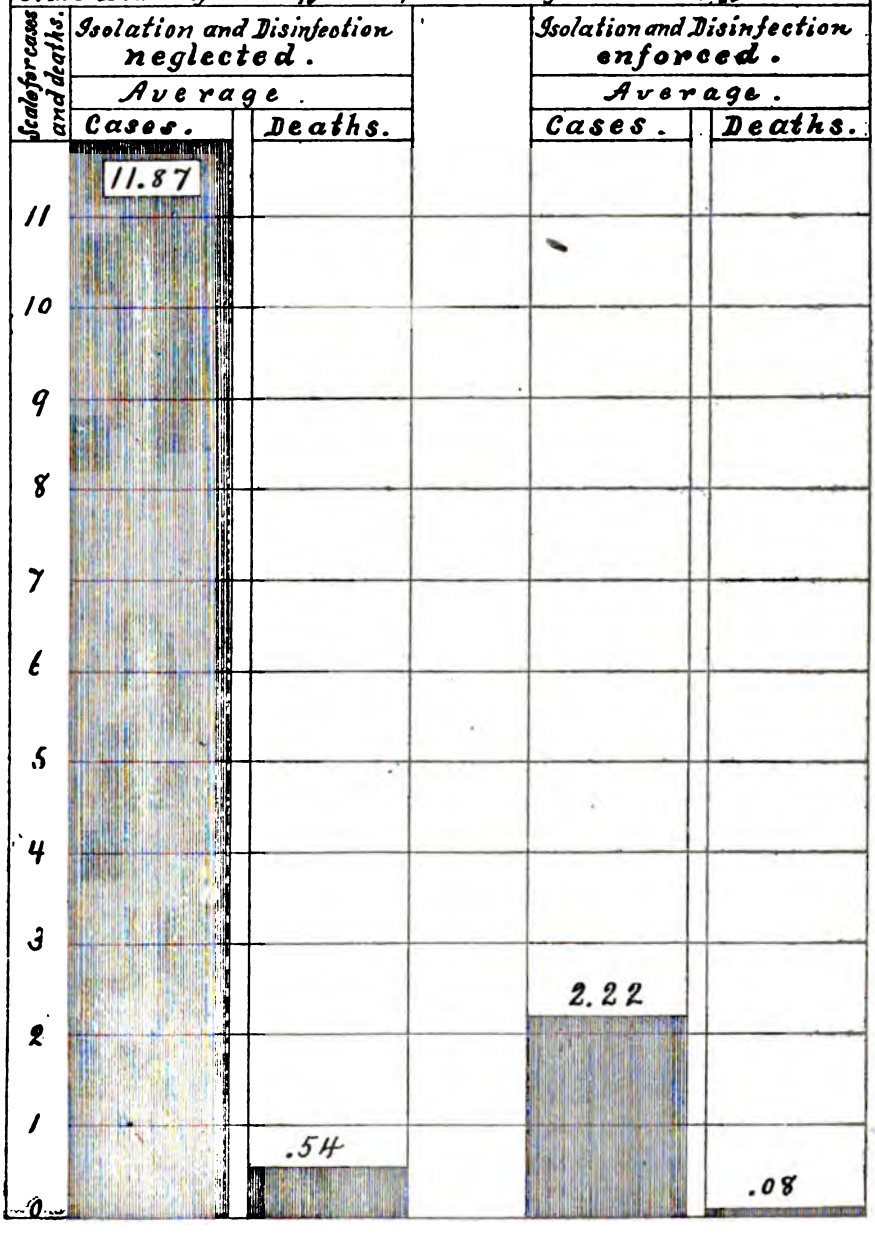
* Probably not all deaths were reported before or since the organization of the Board, consequently the saving is probably greater than is here shown.
† Allowing for increase of population.

DIPHTHERIA.

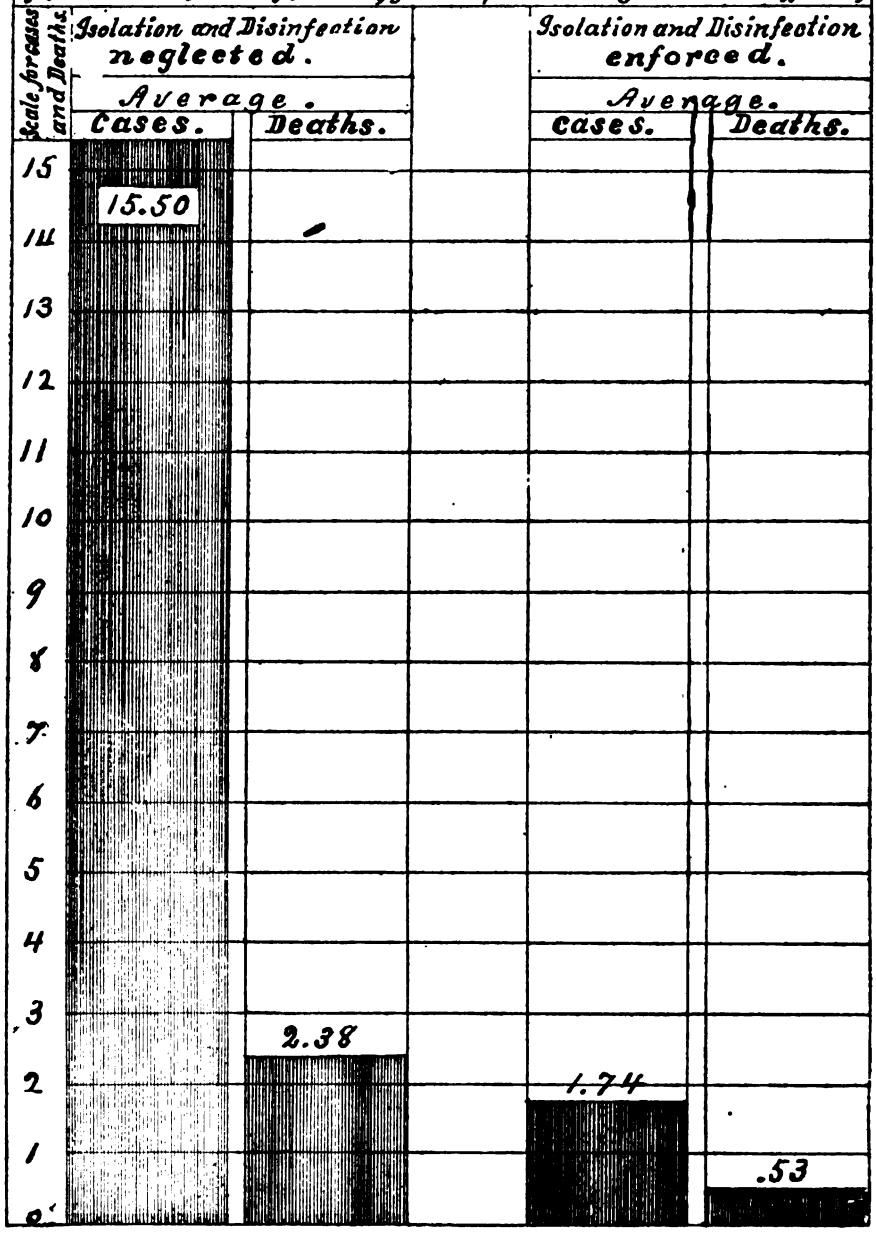
In Michigan diphtheria causes about seventeen times as many deaths as small-pox does. I think it is probably more contagious than small-pox; because the spread of diphtheria is not usually so easily traced, and yet we know that diphtheria is contagious, because it is sometimes very easy to prove this, and to trace its mode of spread. Diphtheria seems to be more frequently spread by indirect means than small-pox is; because if it were not, we ought to be able to trace the spread of diphtheria as easily as we do the spread of small-pox. But whether diphtheria is more or less contagious than small-pox, one important reason why we suffer so very much more mortality from diphtheria than from small-pox is the fact that for diphtheria we have no such preventive measure as vaccination.

Diphtheria is prevented by keeping away from where the disease is, and from everybody and everything that has been near the disease, keeping away until everything has been disinfected. In order that this shall be possible, it is essential that every place where diphtheria is shall be promptly reported and plainly placarded. The law requires the local board of health to "give public notice of infected places," and to "use all possible care to prevent the spreading of the infection." Another law requires the health officer to "give public notice of infected places by placard on the premises,

Scarlet Fever in Michigan in 1888:- Exhibiting the average numbers of cases and deaths per outbreak:- in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



Diphtheria in Michigan in 1888:- Exhibiting the average numbers of cases and deaths per outbreak:- in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



and otherwise if necessary." Common humanity requires of every person that he do his utmost to fulfill the letter and the spirit of all such laws for the public safety against such a terrible disease as diphtheria.

The law has lately been amended, and its provisions should be generally known. It now requires that:

"Whenever any householder, hotel keeper, keeper of a boarding house, or tenant shall know, or shall be informed by a physician, or shall have reason to believe that any person in his family, hotel, boarding house or premises is taken sick with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice (in writing) thereof to the health officer, the president, or the clerk of the Board of Health of the township, city or village in which he resides. Said notice shall state the name of the person sick, the name of the disease, if known, the name of the householder, hotel keeper, keeper of a boarding house or tenant giving the notice, and shall, by street and number, or otherwise, sufficiently designate the house in which he resides or the room in which the sick person may be; and if he shall refuse or (willfully) neglect immediately to give such notice, he shall be deemed guilty of a misdemeanor, and upon conviction thereof he shall be punished by a fine of not exceeding one hundred dollars and the costs of prosecution; or in default of payment thereof, by imprisonment not exceeding ninety days in the county jail, in the discretion of the court: *Provided*, That such fine or imprisonment shall not be enforced if the physician in attendance has given to the health officer or other officer hereinbefore mentioned an immediate notice of said sick person and true name of the disease, in accordance with the requirements of this section."—Section 1675, Howell's Statutes.

As soon as the board of health or the health officer receives notice or has knowledge of a case of diphtheria, or other dangerous communicable disease, the board of health or the health officer has important duties to perform, which it is a great violation of public trust to neglect or postpone. I will not mention all of them; whoever is interested can read them in the pamphlet on the "Work and Duties of Health Officers," published by the State Board of Health and distributed in this audience.* But I may mention here that the law was amended this year (1889), so that any health officer who violates the section which requires prompt action by him in every case of a dangerous communicable disease, is now liable to a fine, and to imprisonment if the fine is not paid; and whoever knowingly violates the orders of the health officer is liable to the same fine and imprisonment. Evidently the people of Michigan intend to do whatever is possible to protect the lives of citizens from these dangerous communicable diseases.

Let us see what success is already attained in the restriction and prevention of diphtheria.

Practical Results in Restricting Diphtheria.

The experience of the health officers in restricting diphtheria in this State is also reported each year to the State Board of Health, and a compilation of these reports shows that 833 lives were saved and 4,374 cases of sickness prevented from diphtheria in Michigan during the year 1886, and that in the year 1887 518 lives were saved and 2,371 cases of sickness prevented; during 1888, 416 lives were saved and 3,292 cases prevented. Thus during

* And to any person who applies to the Secretary State Board of Health, at Lansing.

the three years, 1886, 7 and 8 over ten thousand (10,037) cases of sickness were prevented, and more than seventeen hundred (1,767) lives were saved from diphtheria in Michigan. Or, another way of stating this is to say that during the last three years the *known* saving of life in Michigan from diphtheria has averaged one and a half persons per day.

You may be interested to know the method of estimating the number of cases prevented and lives saves by means of isolation and disinfection. It is as follows: Multiply the *whole number* of outbreaks by the average number of cases and deaths in the *neglected* outbreaks, and the product is the probable number of cases or deaths which would have occured if *all* outbreaks had been neglected. Deduct from this the number of cases or deaths which actually occurred, and the remainder is the indicated number of cases of sickness prevented or lives saved by the efforts made to restrict the disease.

As the local health officers report to the State Board of Health the number of cases and deaths in outbreaks of diphtheria, and also report just what was done (in each outbreak) to restrict the disease, we are thus supplied with the data necessary to learn the success which attends any line of action which is taken. [The diagram on page 60 exhibits graphically the experience in restricting diphtheria in Michigan in 1888.]

TYPHOID FEVER.

Typhoid fever causes about ten times as many deaths in Michigan as small-pox does, and this without counting the deaths from typho-malarial fever, which many now think is really typhoid fever, and therefore preventable.

The most common modes of spread of typhoid fever are not the same as of small-pox, scarlet fever and diphtheria; consequently the measures for its restriction and prevention are not the same. The little pamphlets on this subject issued by the State Board of Health, and freely distributed here, contain plain directions how to prevent typhoid fever, and how to restrict its spread in communities. Those of you who have heard the papers and discussions at this convention probably know that typhoid fever is most frequently spread by means of the drinking water, that the microscopic cause of the disease is probably reproduced in the intestines of persons who have the disease, and that this specific cause gains access to the drinking water by filtering through the soil, and sometimes by being washed into wells or streams from which the drinking water is drawn. The noted instance at Lausanne, Switzerland, where the discharges from typhoid patients were thrown into a small stream, which disappeared by sinking into the earth and gravel, and reappeared about a half mile distant as a mountain spring, the clear water of which caused typhoid fever in 144 persons, is instructive, and is useful for us to hold in mind as illustrative of how the disease may be spread. In this vicinity the usual mode of spread is probably by way of the privy vault and the neighboring well. The facts concerning the outbreak at Lausanne prove (and the same has been indicated in other instances) that the cause of typhoid fever sometimes passes great distances by way of the underground water flowing through strata of gravel.

The prevention and restriction of typhoid fever requires the disinfection of all bowel discharges from those sick with such disease, and constant

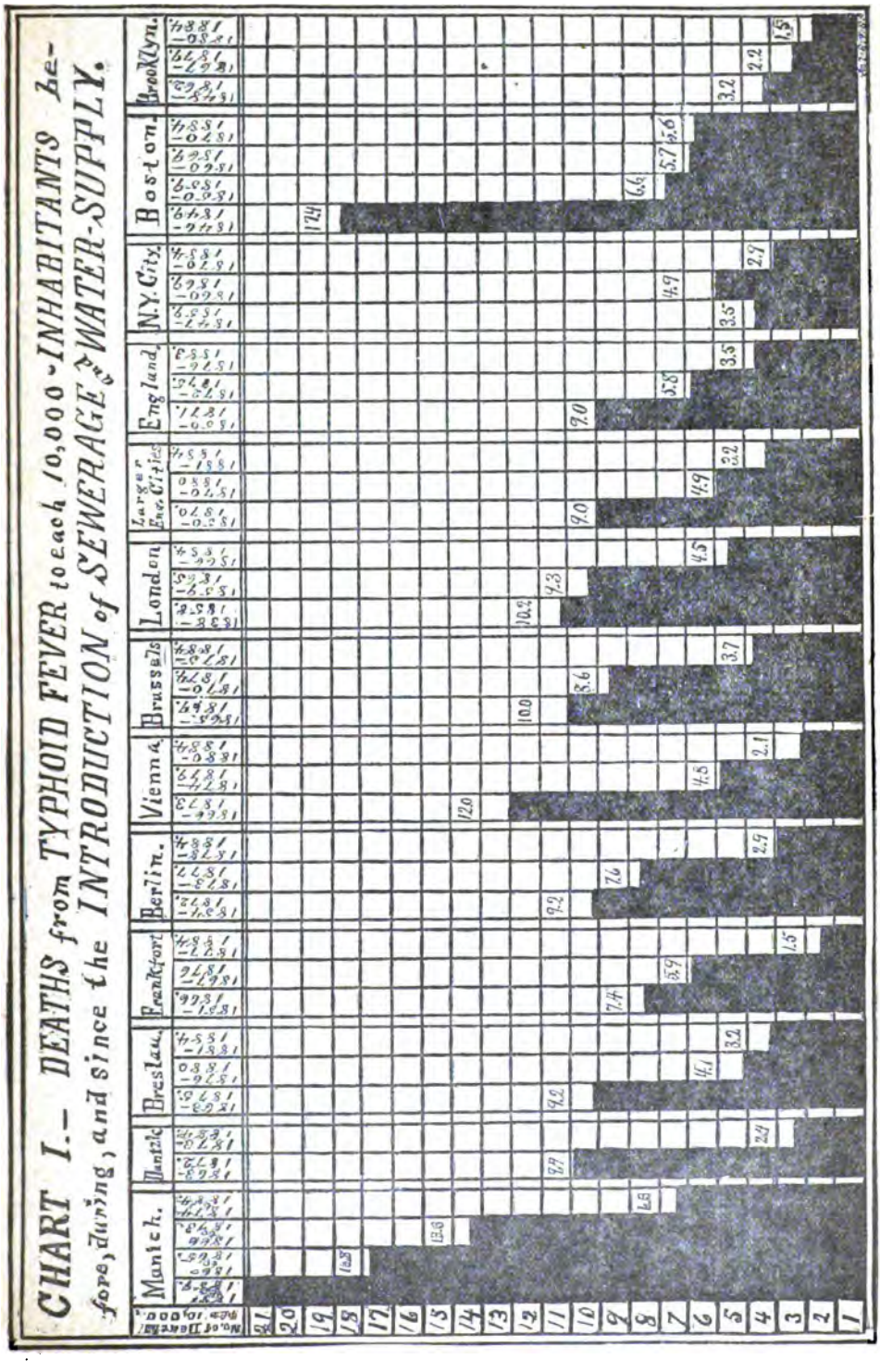


CHART I.— DEATHS from TYPHOID FEVER to each 10,000 INHABITANTS before, during, and since the INTRODUCTION of SEWERAGE & WATER-SUPPLY.
No. of Deaths to 10,000 Inhabitants
Munich.
Dantzic
Breslau
Frankfort
Berlin.
Vienna
Brussels
London
Larger Eng. Cities
England
N.Y. City
Boston.
Brooklyn.
1858-62
1863-67
1868-72
1873-77
1878-82
1883-87
1888-92
1893-97
1898-1902
1903-07
1908-12
1913-17
1918-22
1923-27
1928-32
1933-37
1938-42
1943-47
1948-52
1953-57
1958-62
1963-67
1968-72
1973-77
1978-82
1983-87
1988-92
1993-97
1998-2002
2003-07
2008-12
2013-17
2018-22
2023-27
2028-32
2033-37
2038-42
2043-47
2048-52
2053-57
2058-62
2063-67
2068-72
2073-77
2078-82
2083-87
2088-92
2093-97
2098-2102
2103-07
2108-12
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2133-37
2138-42
2143-47
2148-52
2153-57

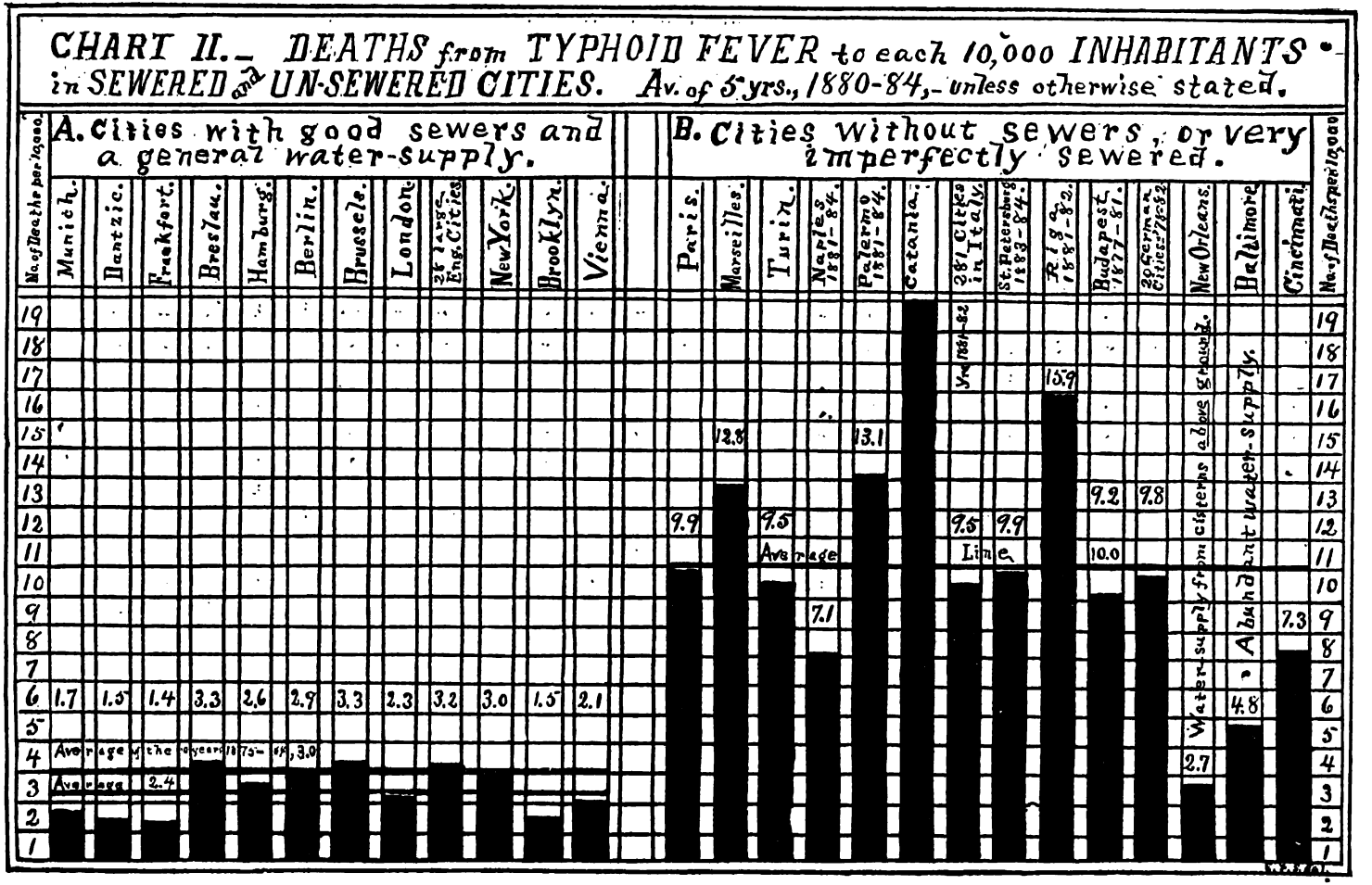


CHART II.— DEATHS from TYPHOID FEVER to each 10,000 INHABITANTS in SEWERED and UN-SEWERED CITIES. Av. of 5 yrs., 1880-84,— unless otherwise stated.
A. Cities with good sewers and a general water-supply.
B. Cities without sewers, or very imperfectly sewered.
No. of Deaths per 10,000.
Munich.
Dantzic.
Frankfort.
Breslau.
Hamburg.
Berlin.
Brussels.
London.
26 large Eng. Cities.
New York.
Brooklyn.
Vienna.
Paris.
Marseilles.
Turin.
Naples 1881-84.
Palermo 1881-84.
Catania.
281 Cities in Italy.
St. Petersburg 1883-84.
Riga 1881-82.
Budapest 1877-81.
38 German Cities 1882
New Orleans.
Baltimore
Cincinnati.
1.7
1.5
1.4
3.3
2.6
2.9
3.3
2.3
3.2
3.0
1.5
2.1
9.9
12.8
9.5
7.1
13.1
9.5
9.9
15.9
9.2
9.8
10.0
2.7
4.8
7.3
Average of the 5 years 1875-79, 3.9
Average 2.4
Average
Water-supply from cisterns & bays generally.
Absolutely water-supply.

watchfulness of the sources of supply of water for drinking and culinary purposes. All water from a suspected source should be boiled before its use. Numerous instances are recorded where typhoid fever has been spread by the rinsing of milk cans with water apparently pure, but really infected with the germs of typhoid fever, capable of infecting the milk. This teaches us the importance of having water free from typhoid infection for all household purposes.

There is not time at my disposal to give all the evidence proving the enormous saving of human life from the ravages of typhoid fever which in recent years has been accomplished because of such knowledge as this to which I have just alluded; but I wish briefly to refer to some of this evidence. In a pamphlet published by the Michigan State Board of Health, and entitled "The Influence of Sewerage and Water-Supply on the Death-Rate in Cities," Mr. Erwin F. Smith, shows conclusively very great reductions in the mortality from typhoid fever in many of the great cities in this country and in foreign countries, the reductions in the typhoid mortality following the introduction of systems of sewerage and general water-supplies. For instance, in the city of Munich the death-rate from typhoid fever in the period from 1854 to 1859 was 24.2 per 10,000 inhabitants, while in 1884 it had declined to 1.4 per 10,000 inhabitants; that is, before the city was sewered, and while it was supplied with water from wells, the mortality from typhoid fever was about twenty-four times as great as it was after the city was well sewered and had a good general water-supply.

To give you a mental image of this important subject, I have had copies made of two diagrams prepared by Mr. Erwin F. Smith to illustrate his paper, and they are here for distribution to such of you as will study them.

[They are printed here, on pages 63 and 64.]

Typhoid fever is a disease which, in my opinion, it is important that citizens of Vicksburg should understand, because of the nature of the soil and earth underlying this place. Sooner or later there will come a time when no well in such a place can be safely relied upon to supply water free from the specific cause of typhoid fever.

The time of greatest danger from typhoid fever is in times of drouth and of low water in wells; in this part of the country it is most common in the autumn months.

CONSUMPTION.

Consumption is our most dangerous communicable disease. In Michigan it causes the death of at least twenty times as many persons as small-pox does. It is the most important cause of death throughout the world. And yet, thanks to the labors of physicians and others in recent times, and more especially to Dr. Robert Koch of the Imperial Board of Health of Germany, this dread disease is now believed to be preventable. In order to know how to prevent or restrict it, it is essential to know how it is spread. Its most common modes of spread are apparently not the same as those of small-pox, scarlet fever or typhoid fever. Briefly, they are as follows:

How Consumption is Spread.

1. Probably by far the most common mode of spread of consumption is by means of dust from the dried sputum spit out by consumptive persons.

2. When this dust is breathed, the danger of its active principle being able to reproduce and cause consumption, in the person who has inhaled it, is not as great among persons who are well nourished and in vigorous health, and whose air-passages are free from any inflammation or abrasion, as among persons not in such conditions.

3. The specific cause of consumption may enter the human body with the food or drink, in which case the danger of its being able to gain a lodgment, and to increase within the body and cause the disease, is not as great to those who are in perfect health and whose alimentary canal is sound throughout as to those who are not in such good condition.

4. The specific cause of consumption may enter the body through a cut, abrasion or broken surface, in which case vigorous health probably lessens the danger of the permanent lodgment of the virus, and the consequent causing of the disease.

5. The dried sputum is not the only source of consumption. The milk and the flesh of animals that have this disease frequently contain the specific cause of the disease. (It is now known that the milk of cows sick with this disease sometimes contains the germs of it even when no disease of the udder can be discovered.)

How Consumption may be Restricted.

All milk from a suspected source should be thoroughly boiled before its use by any person. All meat from a suspected source should be thoroughly cooked.

Inasmuch as under some circumstances boiling the infected milk and ordinary cooking of infected meat is not certain to destroy the specific cause of consumption, the only certain preventive from this source of danger is to reject all milk and meat from animals sick with this disease. For this purpose there should be a thorough inspection of dairies, and of animals slaughtered for human food.

The most important measure for the restriction and prevention of consumption is the disinfection of all sputa from consumptive persons. This may be done in several ways: The sputa may be ejected into spit cups which contain a strong disinfectant; or it may be caught upon rags or soft papers and immediately folded within paper or other wrappings and all be burned at the first opportunity. (If the consumptive should spit upon the handkerchief and allow it to dry there, the spread of the specific cause is then probable, unless great care is afterwards taken in the disinfection of the handkerchief.)

Until such time as that all consumptives shall become aware of the importance of it, and shall thoroughly disinfect or destroy their sputa, it will be of great importance for every person to guard against breathing dust which contains the microscopic germs of consumption. (Experiments show that in rooms occupied by consumptives who use spit cups the *Bacillus tuberculosis*—the germ of consumption—is not found in the dust on the walls of the room in such great numbers as is the case in rooms occupied by consumptives who do not restrict their sputa to spit cups.) The subject of ventilation now takes on a new interest. The sweeping of rooms, the making of beds and the beating of carpets of rooms occupied by consumptives are possible sources of danger of contracting the disease.

But enough has been said to give the most important general principles applicable for the restriction and prevention of consumption.

ATMOSPHERIC INFLUENCES.

With the exception of typhoid fever, every one of the dangerous communicable diseases treated of in this paper are, to a great extent, influenced by conditions of the atmosphere,—small-pox, scarlet fever, diphtheria and consumption all increase after the cold, dry weather, and decrease after the warm, moist weather. The periods of time between the exposure to the weather and the resulting sickness or deaths from each disease bear a relation to the average duration of the disease and of the period of incubation. Thus, scarlet fever and diphtheria having short periods of incubation, and being acute diseases, follow so closely that only a few weeks intervene between the exposure and the time of most cases of *sickness*, while small-pox, having two weeks' or over period of incubation, and several weeks' sickness, the *deaths* average about two months later than the exposure to the weather. The facts are shown in diagrams B, C, D and E, herewith, pages 68, 69, 70 and 71.

The probable explanation of these facts has been published.* Briefly, it seems that it is found in the fact that all the inflammatory diseases of the throat and air-passages are increased after cold, dry weather; there is then greater chance of lodgment of the contagium of each of these diseases in the inflamed surfaces of the throat and air-passages than when those surfaces are sound.

This information adds to the power of individuals and of boards of health to act for the prevention and restriction of these diseases; it shows to boards of health the much greater importance of restrictive measures—isolation and disinfection—during cold, dry seasons of the year; it teaches us that probably individuals can do something for the prevention and restriction of these diseases, by all such measures as lessen the exposure of individuals to the inhalation of cold, dry air, and thus lessen the inflamed surfaces, and the danger of contracting these dangerous communicable diseases which enter by way of the air-passages.

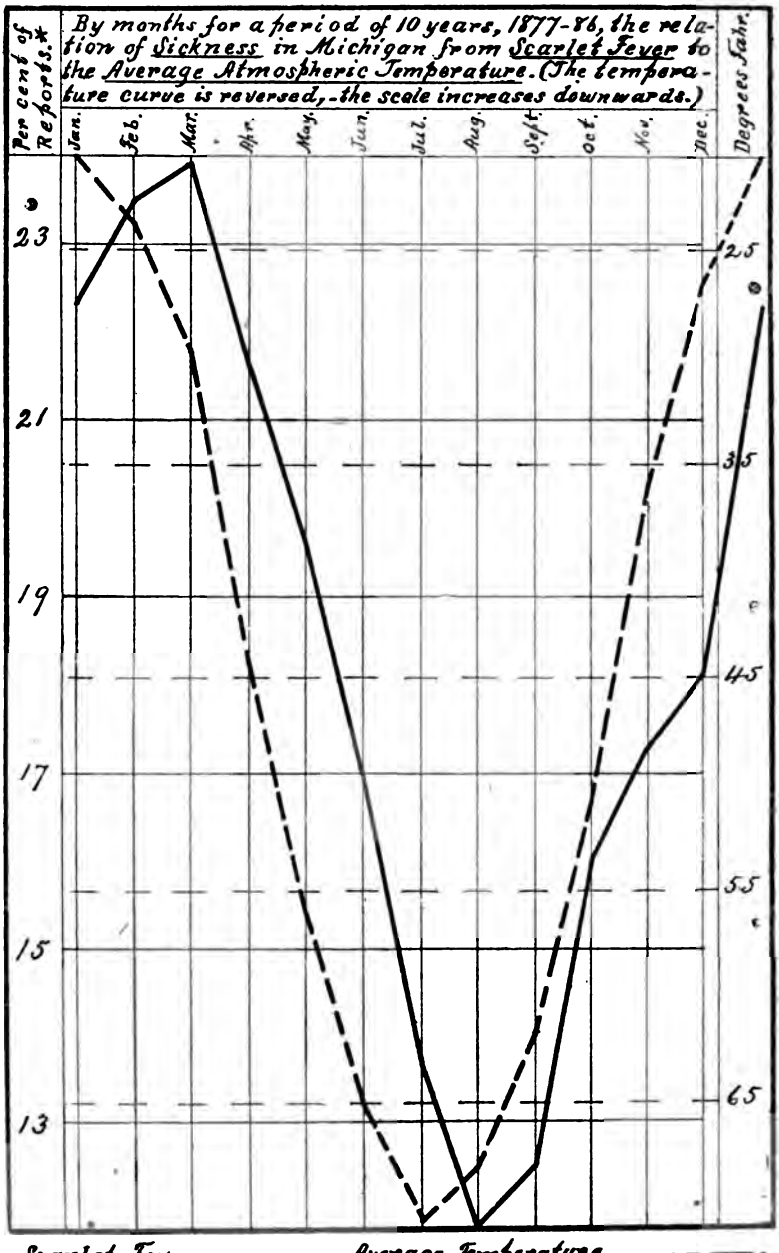
Typhoid fever probably does not usually enter by way of the air-passages, and the time of greatest danger from that disease is not the same as of the other diseases mentioned, but rather the reverse; it follows those inflammatory diseases of the intestines which prevail most after the warm, moist weather, when the water in wells is low. Its time of greatest prevalence is shown in Diagram A, on page 72.

ORGANIZED PROTECTION ESSENTIAL.

As regards all these dangerous communicable diseases, every man is his "brother's keeper;" no one can protect himself or his family except the people generally co-operate for such protection. Our lives are at the mercy of the people at large. Every one, then, has a *vital* interest in the enforce-

* "Causation of the Cold-Weather Diseases," Annual Report, Michigan Board of Health, 1887, pp. 197-211. "Causation of Pneumonia," Report, Michigan Board of Health, 1886, pp. 246-324. "Relation of Certain Meteorological Conditions to Diseases of the Lungs and Air-Passages," Report Michigan Board of Health, 1888, pp. 143-169.

Diagram B.



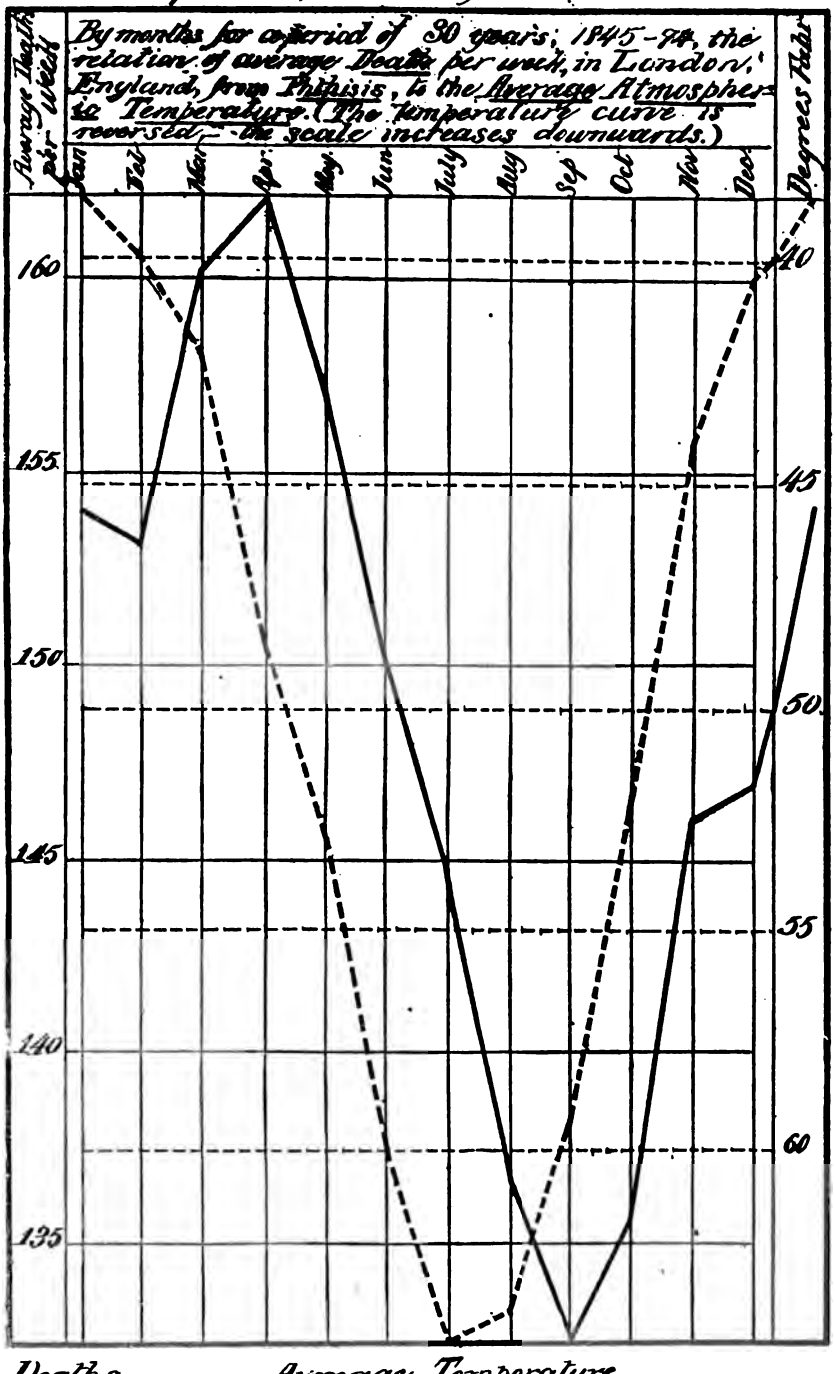
Scarlet Fever _____. Average Temperature — — —.

*Which stated that Scarlet Fever was under the observation of the physicians who made reports.

Over forty-one thousand weekly reports of sickness and over 190,000 observations of the atmospheric Temperature are represented in this diagram.

DIAGRAM C.

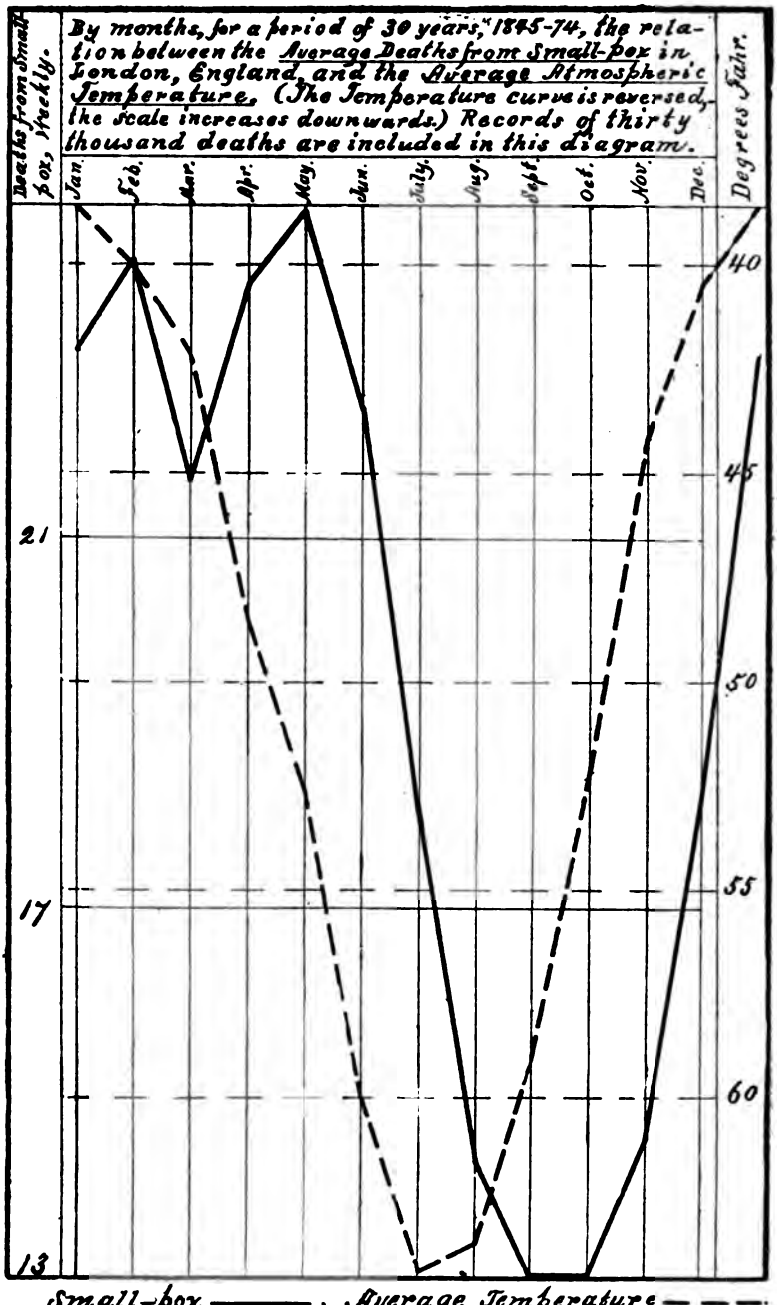
No 10. Temperature, and Deaths from Phthisis in London.



Deaths _____. Average Temperature - - - - - -

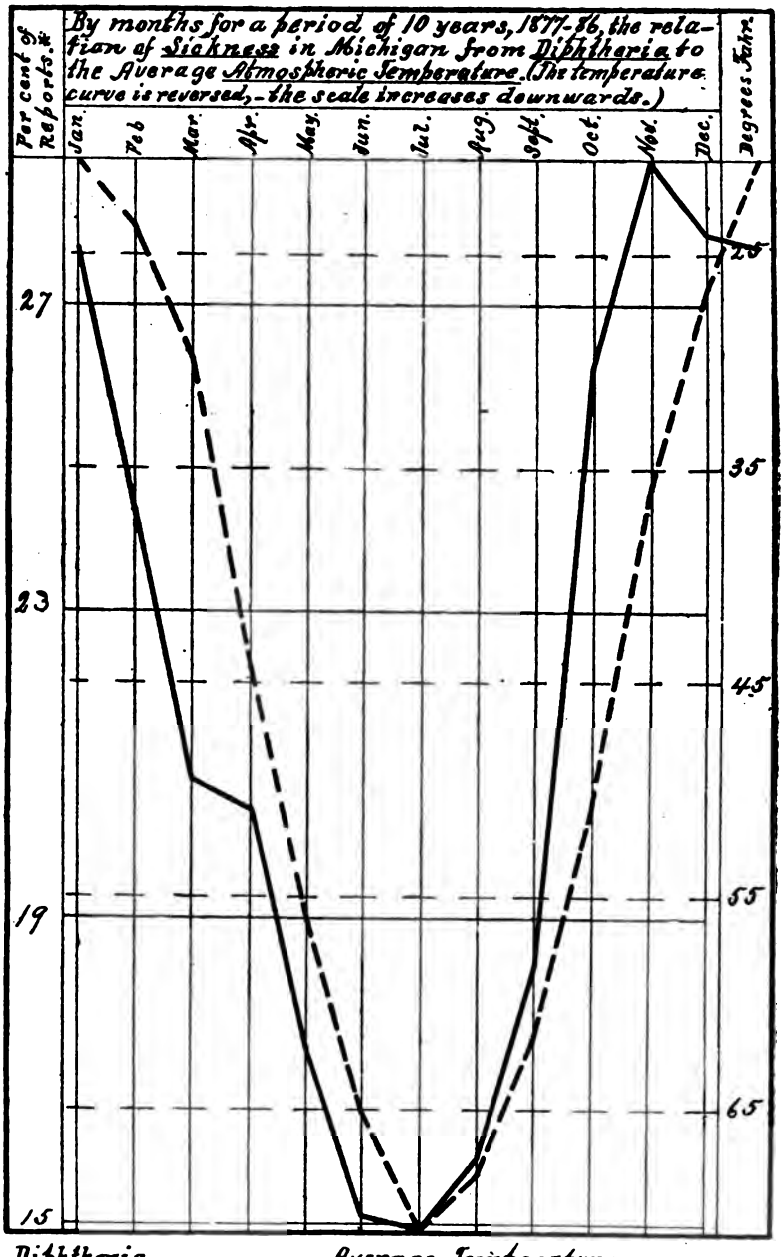
About 231.000 deaths from Phthisis are represented in this diagram data for which are from Jour. of Scottish Met. Soc., New Series Nos XLIII, XLIV, XLV, XLVI, pages 262 and 263.

DIAGRAM D.—*Temperature and Deaths from Small-pox in London.*



Small-pox ———. Average Temperature — — —.
Except in a few months the Small-pox follows two months later than the temperature changes.
The line representing Small-pox should follow as long a time later than a line representing its controlling condition as is the average duration of the fatal cases plus the period of incubation? ●

DIAGRAM E.—*Temperature and Sickness from Diphtheria in Michigan.*



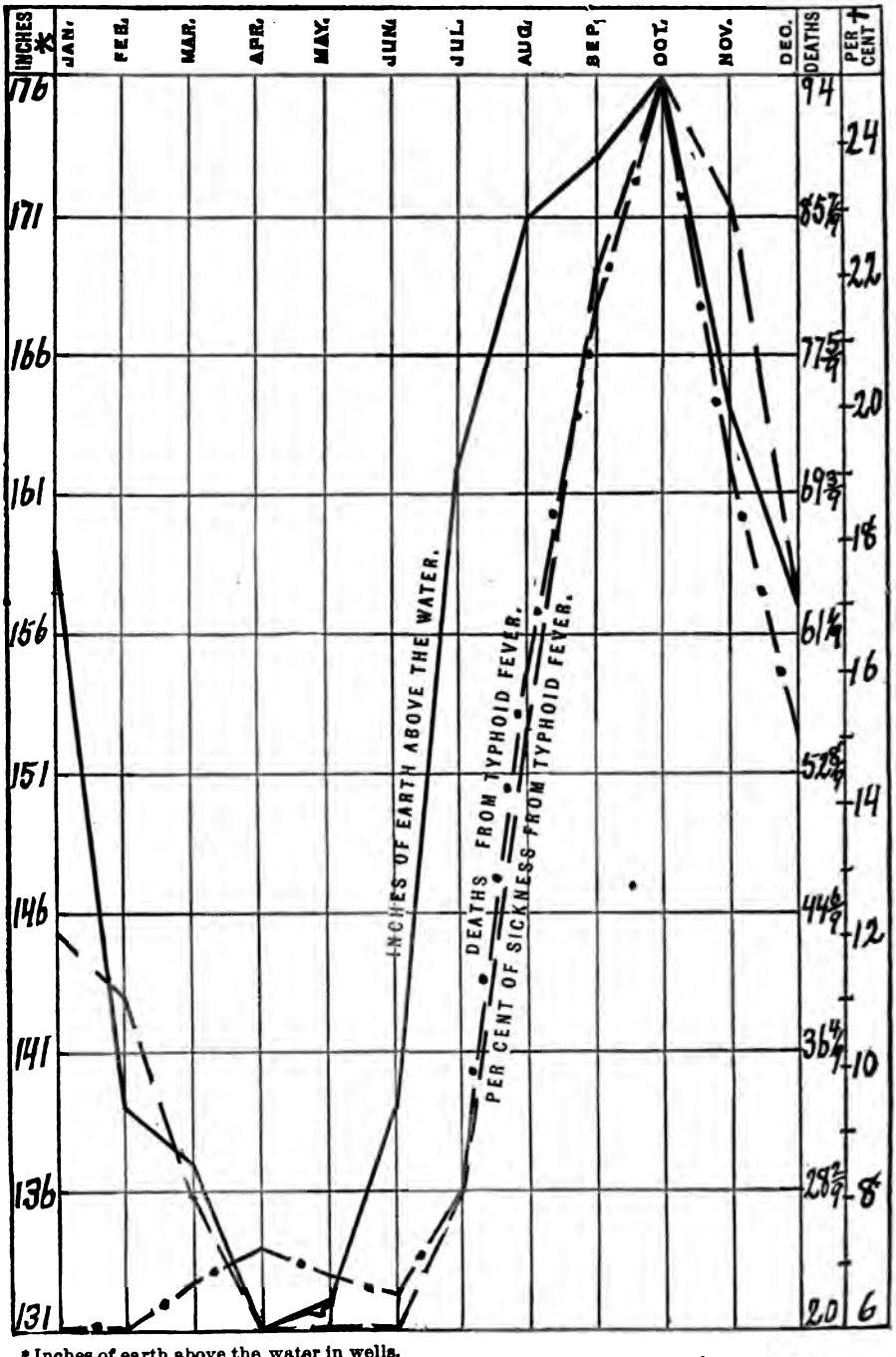
Diphtheria ———. Average Temperature — — —.

*Which stated that diphtheria was under the observation of the physicians who made reports.

Over forty-one thousand weekly reports of sickness, and over 190,000 observations of the atmospheric temperature are represented in this diagram.

TIME OF GREATEST DANGER FROM TYPHOID FEVER.

DIAGRAM A.—*Exhibiting for a period of five years (1878-82) the Average Monthly Oscillations of Ground-water in Michigan, the Deaths reported from Typhoid Fever, and what Per Cent of the Weekly Reports of Sickness Received Stated the Presence of Typhoid Fever.*



* Inches of earth above the water in wells.

† Of all weekly reports received, the per cent which stated the presence of typhoid fever.

NOTE.—The danger from typhoid fever appears to be the greatest in October, when the water in wells is lowest, that is, when there are the most "Inches of earth above the ground water." The danger is least in May, when the ground water, in wells, is highest.

ment of public health-laws, and in all measures, whether specified in the law or not, that tend to make life and health more secure.

SUMMARY OF RECENT SAVING OF LIFE IN MICHIGAN.

The record of the great saving of human life and health in Michigan in recent years is one to which, it seems to me, the State and local boards of health in Michigan can justly "point with pride." It is a record of the saving of over one hundred lives per year from small-pox, four hundred lives per year saved from death by scarlet fever, and nearly six hundred lives per year saved from death by diphtheria—an aggregate of eleven hundred lives per year, or three lives per day saved from these three diseases! This is a record which we ask to have examined, and which we are willing to have compared with that of the man who "made two blades of grass grow where only one grew before."

But the use of this record, which is designed to be made here, is to prove that it is *possible* to save lives from these dangerous communicable diseases, and to prove *how* it can be done. It is important to do this because, notwithstanding the great saving of human life in recent years, it is probable that in each year over five thousand persons in Michigan die from the five dangerous communicable diseases which I have treated of in this paper. That this great waste of human life may, so far as possible, be prevented is the purpose which we have in mind in the holding of such conventions as this, in the preparation of such papers, and in much of the work in the office of the State Board of Health.

Remarks were then made by Dr. V. C. Vaughan and A. Arnold Clark, urging the formation of a local sanitary organization, after which, on motion, Dr. C. H. McKain was appointed a committee to appoint a place and time for the organization of a local Sanitary Association.

The following resolutions were then unanimously adopted:

Resolved, That we, the citizens of Vicksburg and vicinity, tender to the members of the State Board of Health our thanks for giving us this convention, and for their able counsel for our welfare.

Resolved, That a vote of thanks also be extended to visiting friends who have contributed to our convention.

AMERICAN STATISTICAL ASSOCIATION.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

LAPEER, MICHIGAN,

MARCH 27 AND 28, 1890,

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF LAPEER.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1890.]

[No. 331.]

MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING, MICH.:
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS.
1890.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

LAPEER, MARCH 27 AND 28, 1890.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1890.

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of this Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

LAPEER SANITARY CONVENTION.

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT LAPEER, MICHIGAN,

MARCH 27 AND 28, 1890.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1890

This Convention was held, in compliance with an invitation from the citizens of Lapeer, under the direction of a committee from the State Board of Health and a committee of citizens.

The following persons were the local committee: E. C. Roberts, Hugh McColl, M. D., S. M. Vincent, G. W. Hathaway, M. D., Prof. H. C. Rankin, Judge J. B. Moore, W. B. Williams, W. B. Hamilton, and S. D. Brown, Secretary.

The Executive Committee were:—Hugh McColl, M. D., E. O. Jones and H. C. Rankin.

The Finance Committee consisted of Joseph Armstrong and W. B. Hamilton.

The Reception Committee consisted of local physicians, Wm. Robinson, M. D., chairman.

The Music Committee was S. N. Vincent.

The Committee from the State Board of Health was Henry B. Baker, M. D., Lansing, Michigan.

The officers of the Convention were:

President—Hon. W. W. Stickney, Lapeer.

Vice-Presidents—Hugh McColl, M. D., Lapeer; John S. Caulkins, M. D., Thornville; Sparrow A. Snow, M. D., North Branch; William Blake, M. D., Attica; Rev. W. G. Stonex, Lapeer; D. V. Yerex, M. D., Imlay City; J. P. Eggleston, M. D., Imlay City; Hon. R. L. Taylor, Lapeer; Adam Price, M. D., Almont; Geo. W. Stone, M. D., Metamora; Chester Carey, M. D., Columbiaville; James P. Suiter, M. D., Hadley; Arthur H. Thompson, M. D., Lapeer; Lorenzo J. Locy, M. D., Davison Station; W. A. Jackson, M. D., Lapeer.

Treasurer—Prof. H. C. Rankin, Lapeer.

Secretary—S. D. Brown, Lapeer.

Assistant Secretary—A. Arnold Clark, Lansing.

Among those from other localities in attendance at the sessions of this Convention were the following: Dr. Wm. J. Hare, Leonard, Oakland Co.; Dr. J. S. Caulkins, Thornville; Dr. I. E. Parker, Dryden; Dr. J. P. Eggleston, Imlay City; W. J. Kenworthy, St. Ignace; Dr. John Avery, President of the State Board of Health, Greenville; Dr. Henry F. Lyster, member of the State Board of Health, Detroit; Prof. Delos Fall, member of the

State Board of Health, Albion; Dr. Henry B. Baker, member of the State Board of Health, Lansing; and A. Arnold Clark, Lansing, Mich.

First Session.—Thursday, March 27, at 2:30, p. m.

After music by the L. L. C. Club and prayer by Rev. W. G. Stonex, Mayor G. W. Carpenter gave the following address of welcome:

ADDRESS OF WELCOME.

BY MAYOR G. W. CARPENTER, OF LAPEER.

MR. PRESIDENT, LADIES AND GENTLEMEN:

The stereotyped address of welcome by the mayor, wherein much time is employed discussing on the various industries, wealth, and prosperity of one's own town, will not, I trust, be expected of me on this occasion. For while there may be many things to which we may point with pride, in our city, I desire most of all at this time, to congratulate our citizens upon the enjoyment of this rare and important event.

Judging from our past history, we cannot hope for a session of the State Sanitary Convention oftener than once in a lifetime. But with the onward march of scientific research, we trust we may be favored with a more frequent recurrence of the event. And when we consider the importance and acknowledged benefits of a convention of this nature, we can be justly proud of the honor thus conferred upon us.

I take pleasure in tendering the hospitalities of our city to our honored guests. We most heartily welcome you here, and assure you that the liberties of our muncipality are at your command; and, we trust that your sojourn with us will be mutually profitable and enjoyable.

Also to the visitors from the various parts of the county, we extend a cordial greeting; your presence here denotes an enlivened interest in the important subjects presented for discussion.

A thorough knowledge of sanitary science carries with it the preservation of health, strength of mind, happiness, peace and prosperity for all. We have reason therefore, to look for great beneficial results from these meetings to the citizens of Lapeer.

RESPONSE TO THE ADDRESS OF WELCOME AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

BY HON. JOHN AYERY, M. D., PRESIDENT OF THE STATE BOARD OF HEALTH.

In behalf of the State Board of Health I desire to thank you and the citizens of your beautiful town for the cordial greeting and welcome you have given us. We are here for the purpose of discussing those questions which pertain to the interests of the people of your town and the interests of the people of the State, and I am put on the programme to announce the object of the convention. I do not just see why this is. The object of the convention is very clearly announced in the programme. I cannot do it as succinctly and briefly as is stated in the programme, but after thanking you, I desire to say just a few words in regard to the objects of the convention.

When any class of people, at the present day, desire to call attention to any particular movement in which they are engaged, they call a convention, so there have been conventions for the purpose of discussing questions relating to social science, political science and questions pertaining to the public health and interests of the State.

Now if I were to state in a single word the necessities for the general health of a community and town I should use the word "cleanliness." I should say that that comprehended within itself the general requirements of a healthful community and healthful city. To sanitarians, however, cleanliness means something more than a cleanly person and cleanly clothing. It means a clean yard, a clean home; it means cleanliness of the person of course to begin with; it means not only a clean parlor, a clean front room, a clean sleeping room, but it means a clean basement; it means clean cellars; it means clean surroundings; it means clean air in the rooms. Now that is what we understand by cleanliness in the hygienic or sanitary sense. It means all these things.

Now, how shall we have all these cleanly things in our homes. All the means by which they are to be obtained are the proper subjects for discussion. We are to tell you and to hear from you also how you can admit pure air into your rooms; how you can provide clean surroundings for your houses. Now the admission of clean air into a private dwelling implies clean grounds about them,—clean premises; because you cannot take air from filthy surroundings and take it into your dwellings and have it pure air when it comes in. The simple fact that it comes from out of doors is no proof that it is pure. If it comes from a marsh or swamp, a cess-pool or privy vault, or anything of that kind, it is not pure air; so in order that you may have pure air in your homes, you must have pure surroundings. You cannot have pure air in your living room and have the basement filled with decaying vegetable matter. You must have a pure, clean basement. You must have clean surroundings.

A clean home means clean water and clean water means pure water. It includes clean food and that means pure food, so that you must look after your food-supply in order to comply fully with the enlarged meaning, or the sanitary meaning of the word "cleanliness."

Cleanliness in a town implies not only clean homes, but it implies clean streets. It does not mean simply that the front streets should be made a little clean, but that the alleys should be kept clean; that the off-scouring of the city should be moved, destroyed and put where it cannot, by decomposing, do harm to the health of the people.

Besides these general rules for the prevention of diseases, we have a large list of communicable diseases and special work is necessary to prevent their spread.

A communicable disease is one which may be conveyed from a person sick with it to a well one, either by direct contact or through the medium of some infected article or thing.

The known communicable diseases which prevail in Michigan, and to which, as a people, we are most liable, are diphtheria, scarlet fever, measles, whooping cough, typhoid fever and cholera. The best known, the most dreaded, and the least to be feared of these diseases is small-pox. It is often selected as a type of communicable diseases.

Some of these diseases are known to have, and all are believed to have a specific germ or seed from which they grow.

To these communicable diseases we may fairly attribute one-third of the

sickness, and one-third of the deaths which annually occur in Michigan. All communicable diseases are preventable. Many diseases not strictly communicable, are to a considerable extent preventable. Is it worth while to make an effort to prevent one-half of the sickness and one-third of the deaths which annually occur in our State? Sanitarians believe it is best to prevent, as far as possible, and to restrict when they cannot prevent all these diseases. They hold that it is a wise investment of time and money, that it pays in dollars and cents, to make this effort in every community. We believe that the small annual expenditure of money made by Michigan, to prevent and restrict "diseases dangerous to public health" is the best paying investment the State ever made. We think we are able to show by statistics that cannot be successfully disputed, that Michigan has added more to her aggregate wealth during the last ten years by this investment, than by any equal sum expended in any other direction. Now don't be alarmed, I am not going to give the statistics.

This financial consideration takes no account of the suffering of the sick, the anxiety of friends, the sleepless nights of the weary watchers at the bedside of the afflicted, and the dismembered households to be found in every community.

Then, if it is both profitable and right to prevent the spread of these communicable diseases, the question arises, how can it best be done? The answer is plain: it must be by the hearty co-operation of the people with the health authorities of every community. The proper enforcement of any law depends upon the same conditions. It would be difficult, if not impossible, to enforce a law against dram-selling, in a community where two-thirds of the people believed that dram-selling and dram-drinking were right. You would hardly expect the law against horse stealing to be properly enforced in a community of horse thieves. People must first be satisfied that a law is wise and necessary for their protection, before they will make an effort to enforce it. While people believed that epidemics were afflictions sent by the Almighty, they made little effort to avert them. But with a better understanding of the causes of disease, there comes a desire for a better understanding of the means to prevent it. This then is the object of this convention, and it is the work to which the State Board of Health is devoted. We ask your hearty co-operation and earnest efforts to make this convention a success and an instrument of much good to your community.

Now I want to say one word with regard to what this convention is. It is not a convention of doctors for the purpose of discussing questions pertaining to their particular science. It is a convention of the people and it is for the people, and we desire it shall be taken part in by the people of this locality. We are satisfied, that if you attend the sessions of this convention, you will go away with a better impression in regard to the work of the State Board of Health, with an enlarged view of its importance and the value of the work that is being accomplished by it, and that you will become active supporters for the prevention of disease in your community.

Thanking you for the attention you have given me, and thanking the citizens for the large number of people who attend this first session of this convention, I bid you "good-day."

THE CITY BOARD OF HEALTH.

BY JAMES W. SHERWOOD, OF LAPEER.

Mr. President, Ladies and Gentlemen:

The gentleman whose name appears upon the program in connection with this subject, was wise in his day and generation when he withdrew from the consideration of it, and your humble servant was placed in a somewhat anamolous position regarding the same when he accepted it.

The cause for this observation may perhaps be more clearly explained by an extract from the proceedings of the Lapeer common council:

"At a regular meeting of the common council for the city of Lapeer, Michigan, May 20th, 1889, it was

"*Resolved*, by the common council of the city of Lapeer, that from and after the 21st day of May, 1889, the board of health shall be abolished, and the term of the officers of said board shall expire on the said 21st of May, 1889.

"Carried unanimously. S. D. BROWN,
"City Clerk."

Speaking, therefore, in an absolute sense, I am without a subject, and can only treat the question in the abstract, or consider the previous work of the board, thus cut off in the hey-day of its youth and vigor. What considerations influenced our Solons in their action can only be surmised. Perhaps the insiduous voice of the politician persuaded the council that there was danger in the existence of the board. Perhaps the council in their wisdom decided that Lapeer was not as other cities; that she would be preserved from contagious diseases by an interposition of Providence. Perhaps the fact that we had 35 cases of diphtheria and 11 deaths from it during the previous year convinced them that we were too healthy. Perhaps the economists of the council saw in their mind's eye the stringency of the approaching winter, and the hard times that were to ensue, and determined to retrench all expense in the direction of such nonsense as boards of health. Perhaps the excessive remuneration of $60 accorded our friend Dr. Hathaway for his year's service as health officer, was such a drain upon our treasury that it was not considered prudent or sensible to continue it. Perhaps the city attorney was not present to inform them that by Sec. 1633, Howell's annotated statutes, they constituted of themselves a board of health, and that the appointment of a health officer was required by Act No. 202, Laws of 1881, Sec. 2.

Whatever their reason was, is wrapped in profonnd mystery; as these wise people also decided that our printers were becoming too wealthy, and cut off the official printing of their proceedings.

Now let us examine these objections and see if our council is justified in its action, and if past experience will bear it out in its conclusions. On the score of political effect we can at once dismiss the subject. Regarding the average death rate of Lapeer, from all attainable data it is fully abreast of that of Detroit, and the location of the city is such as to cause grave doubts as to its healthfulness.

The business portion is built over a swamp; and through the third and fourth wards run two small streams that, in summer, become mere rivulets; while the exposed banks exhale odors that never had the least connection with "Araby the Blest." The largest residence portion of the city is the

second ward. The cemetery is situated in this ward and on about the highest land in it, with the natural drainage directly toward the most populous portion of the ward.

In this connection, it may also be well to note, that during the year from May, 1888, to May, 1889, out of thirty-three cases of diphtheria eleven cases were in the second ward, and approximately near the cemetery.

Lapeer is not provided with anything in the way of a drainage system, and the soil to a great extent is clay, which of necessity does not absorb and dissipate noxious matter as readily as a sandy soil. Assuming the above to be true, Lapeer is not above the average city as regards healthfulness; and so another surmise falls to the ground. We now come to the financial view of the matter and I think we have our aggregation of wisdom on the hip. It costs to hire a health officer. It costs to fight disease, and Lapeer can't afford it.

The council sees that the community is protected from thieves and fire. It is equally its duty to preserve the public health as far as practicable, and to confine and exterminate contagious diseases. The State throws these safe-guards around its citizens and explicitly says that they shall be observed.

Economy is a virtue, but it surely is not a trait of virtue to neglect that most precious of possessions—health; nor is it commendable economy to lock the stable after the horse is stolen.

It will not be in any degree surprising if our people should suddenly wake to a realization of an epidemic of some nature, and find themselves without proper protection, simply on account of the unwise and unjust measure of economy instituted by the present council.

Sanitary legislation has been brought about by the exigencies of modern society. Local boards of health stand in the relation of sanitary policemen to the people. When a city becomes packed like an ant-hill, and there is every temptation to individuals to disregard the usual laws of health, it is not fair to the individual to leave to his conscience or personal investigation the regulation or detection of defects which are so easily concealed. It is certainly not irrational to hold that the State is bound to use every energy for the prevention of preventable diseases in cities.

But the State can only exercise a general supervision. The local boards must do the work, and at their hand, and through their work must the community look for aid. The local board must be encouraged in its work, and aided by systematic co-operation on the part of the public. Contagious diseases can be isolated and their ravages controlled. The death rate and sickness rate can be reduced in all places.

Do not stop with the appointment of a competent man as health officer, and expect him alone to accomplish results more commendable than the clearing of Augean stables. He can see that open nuisances are abated, that cess-pools are drained, that sanitary information is diffused, that the water-supply is uncontaminated and that cases of infectious disease are placarded and isolated, but he cannot give each household minute attention. Each individual must take it upon himself to lend a helping hand. Keep your own premises in order, clean out your own cellars. Open the windows and let the pure air in. Become a sanitarian on your own premises and your example will work good in your neighborhood.

Sanitation is only common sense applied to every day life. Observe the

ordinary laws of health and see that your premises are well drained and that no filth pollutes your wells.

Health officers no doubt are often retarded in their efforts by the ignorance of the very people they seek to aid. A distrust of the official and an idea that he is interfering with some sacred right, throws obstacles in the officer's way that, to say the least, are oftentimes disheartening.

Regarding this phase of the question, it seems to me that the only solution of the matter is education. Teach the children in our schools the value of sanitation, and you may be well assured that they will carry the lesson home, and disseminate the information in a way that will eventually work good.

Hold up the hands of your local board (providing, of course, we can get one), aid it with your suggestions, whether they are observed or not, and don't hesitate to say that you consider the money paid an efficient health officer as well spent, and that you get interest in a hundred fold on the investment.

Our council is not only legally bound to afford us this protection, but should do it from motives of humanity, not under compulsion. It should extend the same protection to the wealth of the toiler, his health, that they do to the riches of the more fortunate.

Gentlemen of the State Board of Health, your coming is most opportune and we greet you with a lively anticipation of the favorable results that may ensue. I trust that your presence and your advice may bring about a public sentiment that will again give us a board of health in Lapeer.

It is in the hands of our citizens to rectify this matter. It is in their hands to convince our council economists that the course they pursue in regard to our city board of health is wrong, and that the health interests of Lapeer do not deserve the niggardly and unjust treatment at their hands which they now receive.

THE USEFULNESS OF A BOARD OF HEALTH.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH
LANSING, MICHIGAN.

MR. PRESIDENT, LADIES AND GENTLEMEN: I have prepared what I shall read to you in answer to the question—

OF WHAT USE AND VALUE IS A BOARD OF HEALTH IN LAPEER?

If a board of health were to do only what in times past have been considered the chief duties of such a board, then, at the present time, there would be little need for a board of health in Lapeer. Because those chief duties were formerly thought to be only the abatement of such nuisances as were evidently abominable, and the care of outbreaks of such diseases as small-pox, and cholera; and there are now in Lapeer no such diseases, and no very abominable nuisances which require attention.

But within the past few years we have learned very much about life-saving methods, quite different from those old ones, and this new knowledge has made this subject of local boards of health of much greater interest and importance than it was in former times.

We have learned that many of our most common diseases can be prevented, and that for their prevention we must have well organized and active boards of health, and efficient health officers to carry out the orders of the board, and to do what the law requires shall be done.

Some of the laws in this State are based upon this comparatively new knowledge of the possibility of preventing disease and death by proper local health measures. And the fact that in every city a local board of health and a health officer are required by laws made in accordance with the constitution of this State, which each city officer immediately after his election takes a solemn oath to support,—this fact ought to be sufficient to convince those city officers whose duty it is under the law to act on this subject, that the maintenance of a city board of health and of an efficient health officer is the proper thing to do.

In this free country, however, most of us are so constituted that we want to know what is the use of any particular line of action, especially if the law requires us to take such action. It is useful, then, to consider what are the benefits which we may expect to derive from a compliance with the health laws in this State. For this purpose it is well for us to study just what these comparatively new health laws are and what are the effects that follow their disobedience, and what are the effects that follow their fulfillment.

The class of common diseases, from which it has been found to be so easy to prevent much sickness and many deaths, includes what are now called the "communicable" diseases—such diseases as scarlet fever and diphtheria—diseases which are spread from person to person, directly or indirectly. Some of these diseases have been called "contagious," and some of them "infectious" diseases. We now use the term "communicable" diseases which includes all such as are "catching" or are spread by any means from a first case.

How can communicable diseases be prevented? By restricting such a disease to the first case that appears in the locality.

How can a communicable disease be restricted? By so isolating the sick person that none of the contagium of the disease is permitted to reach any other person susceptible to that disease. But it has been found that, unless measures are taken to destroy it, the contagium clings about clothing and premises where a person sick with a communicable disease has been, so that *isolation* of the sick person is not enough, we must *disinfect* the premises, and everything that has been infected. The two important measures for the restriction of the dangerous communicable diseases are *isolation* and *disinfection.*

But in order to have isolation and disinfection we must have two other t-i-o-n—tions; we must have *notification* and *co-operation.*

It is more important that prompt general notice and alarm be given of the outbreak of a dangerous communicable disease, than of a house on fire, because the disease always endangers life, while the fire usually endangers only property. We want, then, notice of every communicable disease, to be given to the health department as promptly as it is given to the fire department on the occurrence of a fire.

Then, when we have the notice of the disease, we need to have a general *co-operation* of all the people in the place; because if all persons except one stay away from the infected house, and avoid every movement that would spread the disease, and one person disregards this duty to fellow-creatures

and visits the infected house, and then, without disinfection, goes about freely, the disease may be spread generally throughout the city.

The four measures that need to be observed, then, are *notification, co-operation, isolation,* and *disinfection.* How can these be secured? How are these provided for in our State laws? The answer to this question seems to me important, because our State laws are designed to specify what it is that we shall do for the public interest and welfare. The law says:

(1734) SEC. 43. Whenever any Householder, hotel keeper, keeper of a boarding house, or tenant shall know, or shall be informed by a physician, or shall have reason to believe that any person in his family, hotel, boarding house or premises is taken sick with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice (in writing) thereof to the health officer, the president, or the clerk of the board of health of the township, city or village in which he resides. Said notice shall state the name of the person sick, the name of the disease, if known, the name of the householder, hotel keeper, keeper of boarding house or tenant giving the notice, and shall, by street and number, or otherwise, sufficiently designate the house in which he resides or the room in which the sick person may be; and if he shall refuse or (willfully) neglect immediately to give such notice, he shall be deemed guilty of a misdemeanor, and upon conviction thereof he shall be punished by a fine of not exceeding one hundred dollars and the costs of prosecution; or in default of payment thereof, by imprisonment not exceeding ninety days in the county jail, in the discretion of the court; *Provided*, That such fine or imprisonment shall not be enforced if the physician in attendance has given to the health officer or other officer hereinbefore mentioned an immediate notice of said sick person and true name of the disease, in accordance with the requirements of this section.—§1675, Howell's statutes.

A similar notice is required to be made by any physician respecting "any person whom he is called to visit, or who is brought to him for examination" whenever the physician shall know that any such person is infected with any "disease dangerous to the public health." (A dangerous communicable disease *is* a "disease dangerous to the public health.") This law provides only that notice shall be given to some officer of the local board of health. It is essential that *public* notice shall be given. Therefore, whenever such local officer receives such a notice, he has important duties to perform which it is a great violation of public trust for him to neglect or postpone.

The law (§1673 Howell's statutes) says that when any "disease dangerous to the public health" is found to exist in any township [city or village as the case may be], the board of health shall use all possible care to prevent the spreading of the infection, and to give public notice of infected places to travelers, by such means as in their judgment shall be most effectual for the common safety." Here, then, is a great duty which is required to be performed by the local board of health; it is to receive notices of the occurrence of dangerous communicable diseases, and to act promptly to place such notices before the people whom it is their duty to protect. It is not enough that they shall give public notice, but the board must "use all possible care to prevent the spreading of the infection." We need a health department in a city to protect our *lives* from such diseases fully as much as we need a fire department to protect our *property* from fire. And the action of the health department should be fully as prompt as that of the fire department, because a human life may be endangered by any delay.

The law (Act 137 Laws of 1883) guards against any delay, by requiring that every board of health shall have a health officer, who shall be an executive officer of the board, and, unless under extraordinary circumstances he shall be otherwise instructed by his board, it is his duty "immediately to investigate" the subject whenever he shall receive notice or have good

reason to believe that there is within his jurisdiction a case of diphtheria, scarlet fever or other one of these communicable diseases "dangerous to the public health." Not only must the health officer investigate, he must act promptly for the restriction of the disease. If he violates this law he is liable to a fine, and, if the fine is not paid, to imprisonment. One of the duties of the health officer is to keep the Secretary of the State Board of Health constantly informed respecting every outbreak of a dangerous communicable disease. This is done by means of special and weekly reports, and it frequently happens that the office of the State Board of Health is then able to do much that aids in the restriction of one of these diseases, sometimes by notices of warning to other local boards of health, and sometimes by supplying pamphlets of concise directions how to restrict the disease,—these pamphlets being designed to be distributed to the neighbors of the family in which the dangerous disease is, persons thus threatened, being especially interested, are most ready to read and act upon the advice of the State Board of Health. Some of these pamphlets telling how to restrict diphtheria, scarlet fever, and typhoid fever, are here for distribution to all who wish to have them or to examine them.

RESULTS OF DISOBEDIENCE, AND OF FULFILLMENT OF HEALTH LAWS.

Now let us see what are the results of the disobedience, and of the fulfillment of these health laws. What good does it all do? Thanks to the careful work of hundreds of faithful health officers in Michigan, we are now able to answer this question so clearly and distinctly that the wayfaring man though a doubter, may understand, appreciate, and be convinced of the great usefulness of compliance with these laws.

Through a system of final reports of outbreaks, and annual reports by health officers, the office of the State Board of Health is informed of the results of the outbreaks of dangerous communicable diseases. We learn the number of cases and deaths, and just what was done in each outbreak. We compile these reports in a way to find out just what was the result of all those outbreaks in which the proper and legal methods of restriction were observed, and what was the result in all those outbreaks in which they were not observed. I have here a number of diagrams* which show at a glance the comparative numbers of cases and of deaths from diphtheria in outbreaks in which isolation and disinfection were enforced, and in outbreaks in which these measures were neglected. Similar diagrams exhibit the facts concerning scarlet fever.† Every year we make these diagrams of comparison of results of disobedience and of fulfillment of these important health measures; and the evidence each year adds to the force of what we had before, until now it seems certain that there are five times as many cases, and five times as many deaths from these diseases in those localities where isolation and disinfection are not enforced as there are in those localities where they are enforced.

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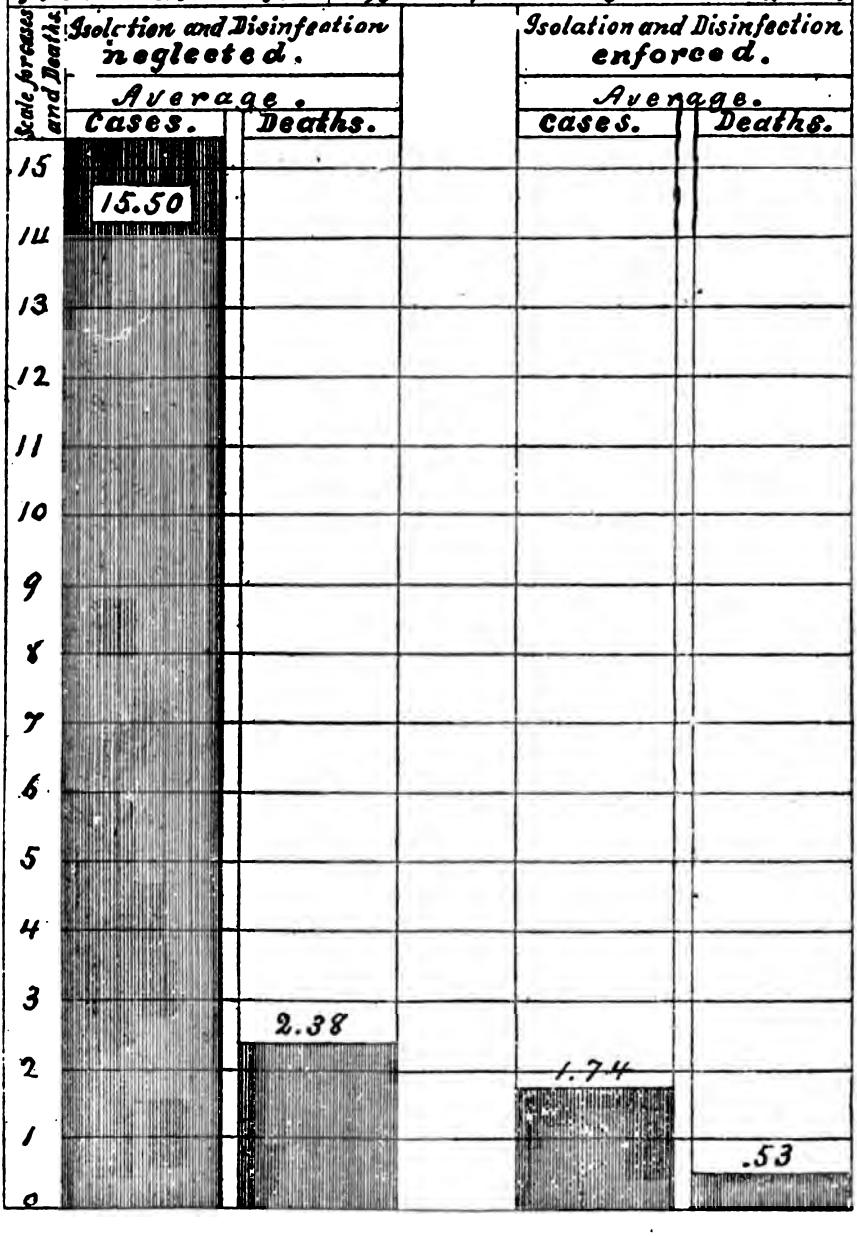
*Printed on page 11.
† Printed on page 12.

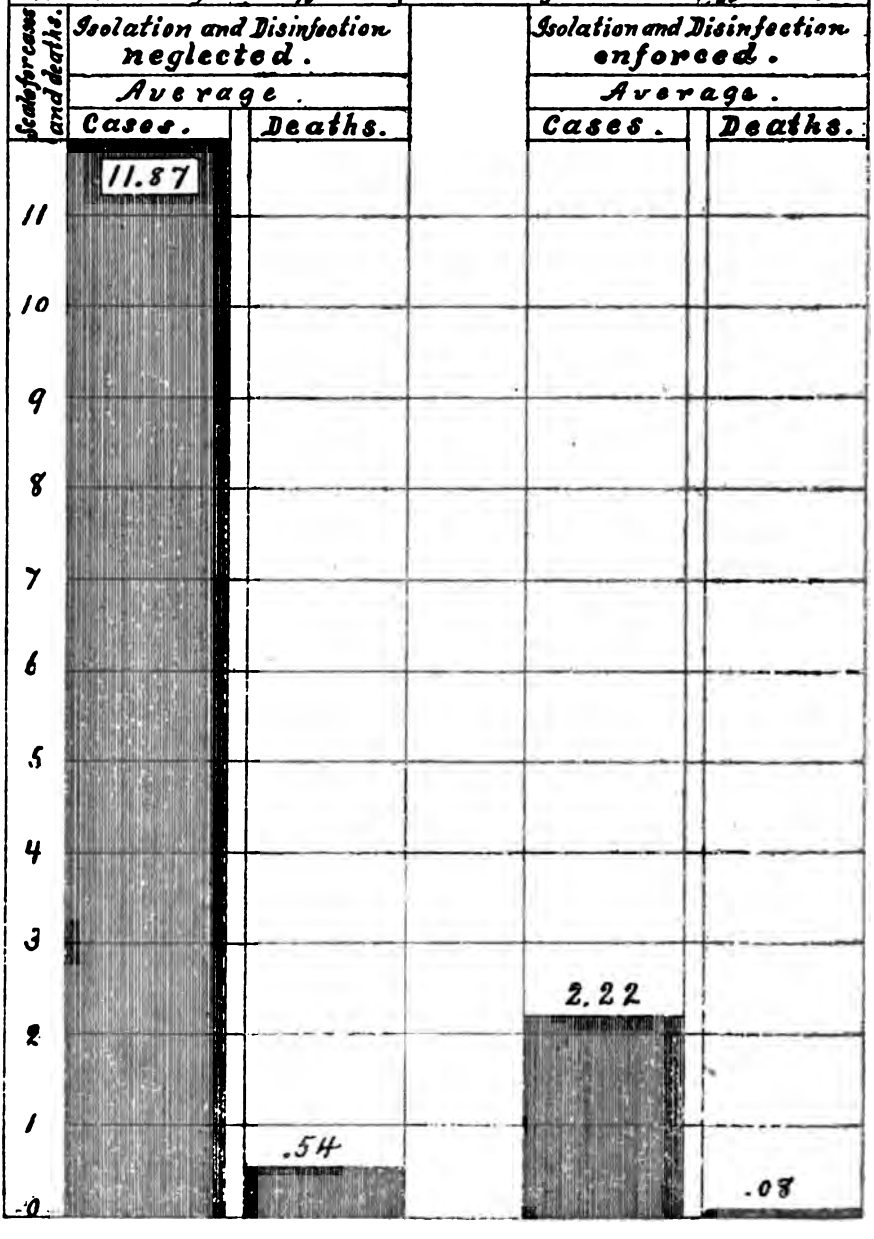
ISOLATION AND DISINFECTION RESTRICT DIPHTHERIA.

Diphtheria in Michigan in 1888:- Exhibiting the average numbers of cases and deaths per outbreak:- in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



ISOLATION AND DISINFECTION RESTRICT SCARLET FEVER.

Scarlet Fever in Michigan in 1888:- Exhibiting the average numbers of cases and deaths per outbreak:- in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



This evidence teaches us that in those localities in which health laws and measures are enforced, four-fifths less sickness and deaths occur than occur in those localities where these measures are not enforced.

We believe, therefore, that four-fifths of the cases and deaths from these diseases can be prevented; and that in some localities they are prevented. This should be done in every locality, and in every year.

What difference does it make whether or not this is done in Lapeer?

I believe there are in Lapeer about three thousand inhabitants. The average death-rate is about seventeen per thousand per year, or about forty-one deaths. At least one-fourth, say ten of these deaths are from dangerous communicable diseases that should be, in great part prevented. * Four-fifths of the ten would be eight lives which should be saved in each year, in a city of the size of Lapeer, by the thorough enforcement of the health laws, and the hearty coöperation of the people of the city for that purpose. Those eight persons, who in each year are cut off prematurely, if they lived out their lives would earn, over and above the cost of their maintenance, a large sum of money, a sum which would amply support such a board of health, such a vigorous and active health officer as should be constantly employed in this city, and such prompt and thorough health measures as I have just outlined.

If you value your citizens as highly as the slave owners down south valued their slaves, those eight persons that you probably lose every year would be worth at least five thousand dollars. Then, you bury in your graveyard friends and relatives whose lives, if proper measures were taken, might be saved, and, if saved, they would add to the wealth of this city at least five thousand dollars. This is repeated each year. This seems to me like awfully cruel talk, but talking it is not half so cruel as permitting it to be done; and it is because I believe you are permitting it to be done, unknowingly and unintentionally, and that if you could see the truth as I believe I see it, you would put a stop to it, that I bring myself to state the case to you in a way which I hope will attract your attention to the subject.

I know it is easy to persuade ourselves that everything is going on about us as well as possible, and that there is no pressing need for improvement. It is easy to collect the deaths for a year, or for a few years, and to find that a city like Lapeer has had very few deaths, and especially few from the dangerous communicable diseases that could have been prevented; but

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**The number of reported deaths, from all causes, in Michigan during the thirteen years, 1874–86; also the numbers of reported deaths from Consumption, Diphtheria, Scarlet Fever and Typhoid Fever, during the same period, and what the per cent of deaths from each and from all of these four diseases is of the deaths from all causes.*

Compiled from Registration Reports of Michigan.

All Deaths.	Sum of Deaths from the four Diseases.	Consumption.	Diphtheria.	Scarlet Fever.	Typhoid Fever.
196,718	48,253	23,496	12,948	5,423	6,386
Per cent.....	24.3	11.8	6.5	2.7	3.2

By the above table it will be seen that 3.2 per cent of all the deaths have been from typhoid fever; 2.7 per cent from scarlet fever; 6.5 per cent from diphtheria; and 11.8 per cent from consumption; and that 24.3 per cent of all the deaths have been from these four diseases, which are now believed to be in great part preventable by measures which are practicable by intelligent people in connection with the services of an intelligent and efficient local health officer co-operating with a State Board of Health.

the figures I have given you are averages for similar places for long series of years, and I believe they are not overdrawn.

I earnestly hope you will stop a large proportion of this death-tax, and use a large part of the money thus saved to build up and maintain a model health office, and model health measures in Lapeer.

DISCUSSION.

Hon. John Avery, M. D., of Greenville: I would like to inquire upon what grounds the common council abolished the board of health. The law constituted the common council a board of health and I do not see how they could go to work and put themselves out of office and still retain their position as aldermen of the city. While they hold their position as aldermen the law says they are a board of health. How can they avoid the duties and keep their position?

J. B. Sutton, of Lapeer: (In response to a call) I do not feel like discussing the matter myself, either in justifying or condemning the action of the council.

Dr. Hugh McColl, Lapeer: I hope that our citizens will take part in this discussion and make it interesting. I, for one, have been very much interested in the sanitary condition of this city quite a number of years. I have devoted considerable time to it and was your health officer for a great many years. I never received any pay and never asked any pay. I should have been paid for what I did, but I served this community for a large number of years as health officer without pay, except for printed material, stationery, etc.

At the present time our city council, the common council, constitute the Board of Health, but there is a very important duty that has not been performed. The law says that the council shall appoint a health officer. Now our common council has violated the law in not appointing a health officer. There is not one member of our common council, I think, who will take any action in regard to diseases, the disinfection of buildings or the isolation of cases in any way, and unless there is some one individual appointed for that purpose, whose business it is to attend to such work, the work will not be attended to, and we are doing ourselves a great deal of harm, and our example may be injurious to other communities.

The fees last year, I think, were $60 to the health officer. Now in this community, and other communities of its size, we should have a health officer who would be accurate in his work and would be willing to do that work, and who should be paid sufficient for what he does, not for the work he does alone, but for the ill-will he incurs. I know something of the ill-will I incurred, and, while it does no harm, it is unpleasant sometimes to carry.

Judge W. W. Stickney, President of the Convention: Thought the question one of great importance to the citizens of Lapeer and hoped something more would be said in regard to the matter.

Henry B. Baker, M. D., Lansing, Michigan: I dislike to take any time, but it seems to me the best phase of it is that the subject has not come before the council. It may be also that there has been no wrong action. Only proper action has not been taken. It may be simply neglect. I would like to ask the members of the council if that is the case.

Dr. Hugh McColl, of Lapeer, then read the resolution passed by the common council which set forth that from and after the first day of May,

1889, the board of health should be abolished and he thought that was putting it very strongly.

James Sherwood: Perhaps Dr. Hathaway can throw some light on the subject.

Dr. W. D. Hathaway, of Lapeer: The board of health was supposed to be abolished according to the resolutions passed by the council and at the time the question was considered the council was informed by the city attorney (or at least the city attorney understood it so when I was talking with him) that the city was under a city charter, was an incorporated city under the laws of the State; and the State law says that in every city the council shall appoint a health officer. I do not know how the council can abolish that law, and it was so understood at the time. Why the measure or resolution was passed by the council I do not know. I have never been able to find out, and when I heard that such a thing was going to happen, I immediately corresponded with Dr. Baker to see if this convention could not be held in Lapeer. That was the first movement toward this convention that I know of. In regard to the resolution you have heard it read. It is very strong. Of course my time would expire at the end of the year. That was the law. At the end of the year they saw fit to abolish the board of health and there has never been any explanation in any way that I know anything of.

Judge J. B. Moore, of Lapeer: It is very possible that good may come out of this action of the common council. It is very evident from what has been suggested by our last health officer that the initiatory steps for the holding of this convention in this city are to be attributed primarily to this action of the council, and very indirectly we are obliged to them for the gathering of the people here today. Now I apprehend if matters are not changed from what they were some years ago that the board of health of the city of Lapeer has had to act very much upon its own responsibility, and has been called upon to do disagreeable work, and though these people were engaged in promoting the health of the community, yet the average citizen and the average alderman has been inclined to think we would be better off without the board.

It appearing that the action of the council came about more from neglect than from any other reason, Judge Moore moved that the council be requested, by this convention, to establish a board of health or to elect a health officer to serve the people of the city as provided under the charter.

The motion then prevailed.

RELATIONS OF THE PUBLIC HEALTH TO THE COMMONWEALTH.

BY HON. R. L. TAYLOR, OF LAPEER.

We may perhaps get some light on the nature and extent of the claims which public health has on the Commonwealth if we inquire what is in general the proper province of the Commonwealth.

If Great Britain were to arrest and illegally restrain one of our citizens of his liberty the whole body of our people would be aroused and would demand instant and ample reparation, and the government, in the exercise of its proper functions, would enforce the demand. So also the State stands ready to enforce the rights of the citizens as between each other. It defines rights and lays down rules for the guidance of the citizen and

compels his observance to protect the freedom of the individual from injurious encroachments. It forbids the careless handling of poisons and the sale of adulterated food. It grants no license to anyone to do as he will regardless of the rights of others. It would guarantee to the individual liberty to live and labor in any innocuous manner. It would secure him a fair field in which to run the race for the prizes of life.

What interest has the State in the prevention of suicide? What interest has it in the training and the education of its embryonic citizen? It would be misleading to suppose that it strives in these and a thousand other ways primarily for the good of the individual concerned. It seeks rather the good of the masses through that of the individual. It has need of the life of the would-be suicide. It fears for itself the effects of the example he would set and more valuable still does it deem lives endangered by poison or gunpowder. It wants trained citizens for its own strength and maintenance.

The Commonwealth is but another name for the people organized to secure protection, prosperity and permanence. The word commonwealth tells its own story. It stands for the common weal, the common good. And so it is interested primarily in the strength and welfare of the organization as a whole and consequently concerned to secure the best training and education of all the powers of the individual, even to that of his religious faculties. It wants him strong and healthy in body, vigorous and intelligent in intellect, and upright and pure in motive. "The religious faculties!" some one may exclaim, "do you say the State should teach religion?" No. I say she is concerned for the proper education of the religious faculty. She is so concerned because pure faith and correct motive result in right practice and surely she should be as much interested in those things that lead to right practice, as in compelling right practice; but the State has no power to determine the existence of faith or to judge of a hidden motive or to know the character of an unexpressed opinion. Of these the foundations of religion largely consist, and the State having no power to make them tangible has no power to control them, and an effort to do so would defeat its own end.

We may see from this something of the character and extent of the domain within which the State may properly act. It defines and protects rights; it jealously defends life and property; it educates and restrains. Its efforts are arrested only when there is no longer promise of good results.

It would be useless to attempt to separate the matter of the public health from these other things with which the State deals. It is inextricably connected with many of the most important of them. It is bound up with education, prosperity and life. Indeed the protection of one's health is one of the most valuable of his rights.

And where is there greater need, or promise of greater or speedier results? The State cannot well perform its duties in those other matters and with good grace reject the claims of this. This is both tangible and productive, as we already know, of the best fruit. Of course, much must be left to individuals, but they may be more safely left to defend their rights to property than their rights to health. Especially do they stand in need of information on this whole subject. The dangers to health, are, to the unscientific eye, largely inscrutable. Without suspicion they may lurk in one's own well, cellar, or cesspool; or a careless or ignorant neighbor may set them in motion, to the desolation of one's household. In almost no

other respect is the individual so defenseless. He is, as a rule, without the scientific knowledge and skill to apprehend danger, even if close at hand. Why should not care, in proportion to the peril, be exercised by the State to counteract the evil in the seeds of disease that lurk in the ooze unseen, as is exercised in respect to Paris green, whose character is well known.

Why, by the way, is there so much care proportionately taken in the case of Paris green, and so little in the case of the poison of alcohol and tobacco? How does the actual injury done by Paris green compare with that done by alchoholic drinks and narcotics? It is said that alcohol is the source of numberless diseases, and even of madness and insanity, besides untold poverty and distress. The majority of murders even, are ascribed to it. It would be interesting to make a computation to determine the comparative injury done by alcohol and Paris green. Try it. It may be the State expends too much anxiety on Paris green.

I shall only take time to say further that we may well welcome this sanitary convention, make the most of its visit, and pray for its early return. It brings information of disease, and of danger to health, to our doors, and, it is information that we need.

Much has been done already, as shown by the increased average of human life, but few there are yet who live out all their days. Much can yet be accomplished. When the people have their vision opened to discern the breeeding places of the germs of disease, and learn how to destroy them; when they are impressed with the dangers of excess and intemperance, and when they understand better the laws governing the communication of disease, they will speedily repay the commonwealth for her care, by showing in the census returns an increasing average in the length of human life.

THE COMMONWEALTH AND THE COMMON HEALTH.

DISCUSSION BY PROF. A. ARNOLD CLARK, LANSING, MICH.

In the discussion of this question we might plant ourselves on the Declaration of Independence and assert that all men have inalienable rights to life and happiness and that to guarantee those rights governments are instituted among men.

It would seem unnecessary to argue seriously that a human life is worth something. Dr. Talmage referring to the fountain of Eternal Youth which Ponce de Leon tried to discover, says that if there were such a fountain and its waters were bottled up at a thousand dollars a bottle the demand would be greater than the supply, and we would shake up the potent liquid and if directed to take a teaspoonful would be so anxious to make sure work that we would take a tablespoonful or a glassful. It is not necessary to argue with a man that life is worth something when you are talking about his own life.

Still this is a very practical age,—an age in which we ask of everything —even honesty itself—will it pay?—an age in which like Thomas Gradgrind we measure out everything in economic scales and with a financial measuring stick, and I am glad that the previous speakers have given so much attention to the money interest which the commonwealth has in the common health.

When I bought my ticket from Lansing to Lapeer I dropped a nickle in the slot and obtained another ticket which I hold in my hand which informs

me that if I had lost my life on the Grand Trunk railroad a certain amount of money would have been paid to my relatives. Evidently those who originated this scheme believed that a human life has some value.

Two or three months ago a ranchman in San Juan county, New Mexico, killed an Indian, and the Indians demanded ten head of horses or two hundred dollars as the money value of that dead buck. They sent their squaws back into the interior and threatened to kill every white settler on the San Juan river if that money was not paid to the widow of the Indian. There was a squaw who would not lose her husband for a cent less than two hundred dollars.

Our Teutonic fathers carried a similar custom to England. It was called the blood feud. They hardly looked upon homicide as a crime, but they did appreciate that every life had a money value to the community. So every man who took another's life was liable to a fine. This fine was paid in part to the family and in part to the State, and was supposed to represent the

MONEY VALUE OF THAT MAN.

Thus it cost less to murder a slave, more to murder an artisan, while taking the life of an English baron came quite expensive.

So there is today on the statute books of most States a law providing damages for the wrongful taking of a human life, whether by negligence or feloniously. The maximum amount of damages which can be collected in most States is $5,000, and the minimum amount is $1,000. Now, I know it seems almost like sacrilege to talk about the money value of a human life, it seems almost like sacrilege to put the pound of sacred flesh into the same scales with the three thousand ducats; but it is a fact whether we consider man as the law considers him, whether we sit down as did William Farr with a life table in our hands and calculate the future annual earnings of a man at a given age, subtract his future cost of living and take the capitalized remainder as the value of the man, whether we say as some say that every man is worth to the community just what it will cost to train up from infancy another just like him, or whether we remember in a common sense sort of a way that in the markets of the south a slave sold for a thousand dollars,—it is a fact that every man who is not sick or a vagrant will give the world more than he will take from it. No man ever yet lived and labored but the world was richer because he lived and labored. Every death tends to bankrupt the nation.

More than that. Every time one man dies there are a dozen sick, and

SICKNESS IN A COMMUNITY IS A FINANCIAL PANIC.

Do you doubt it? Reflect that, when you are sick, you pay at least fifty cents a day to your physician, and as much for nurses, reflect that during this time you lose your wages. Max von Pettenkofer states that every citizen of Germany is sick on the average at least twenty days out of each year, or five per cent of his entire time. If that is true in this State, it means an annual loss of forty million days. Figure out for youself the cost of this financial panic.

Now you have been told this afternoon that one-third of all the sickness and deaths which occur in this State you might prevent. You have been told that in those outbreaks of scarlet fever and diphtheria in this State,

where health officers did not isolate patients and disinfect houses where the cases occurred, there were five times as many cases and five times as many deaths as in those localities where these precautions were carried out. You have been told that in this way thousands of lives have been saved. It is precious little pay those health officers got for their work, but they have the consolation of knowing that they have saved many valuable lives.

The money loss from preventable sickness is too great to be grasped, even by the imagination. A few years ago Dr. Kellogg made a careful estimate that in this State, it could not be placed at less than $10,000,000 each year. Do you doubt it? Reflect that there are 4,000 doctors in Michigan. They receive at least $1,000 a piece each year. That means four million dollars which we pay each year to be cured after we get sick. We would hardly agree to what Dr. Holmes said, that "humanity would be infinitely better off if all the medicine was dumped into the sea, but it would be awful on the fish," and Lowell exaggerated when he said that among doctors there were allopaths, homeopaths, and hydropaths, who agreed in nothing except that the other fellow's path leads to the grave. I have always noticed that those who most criticise the science of medicine, are the first to go to a doctor when they get sick. And I believe that since the old religious orders, there has not been found anywhere, greater devotion to humanity, than among physicians. They never require a retainer, they are ready to go at all hours of the night and day, they know that doctors die younger than those in any other profession, and yet they are ready to face not only personal discomfort, but the most dangerous diseases to allay pain. But the point is this: would it not be better to salary these doctors to keep us well rather than pay them to cure us after we get sick? We might not go so far as the Sultan of Turkey who, it is said, pays his physician as long as he is well, docks him his wages when he gets sick, and when the Sultan dies the doctor must die too. Neither need we go so far as they do in Chili, where the family physician is obliged to follow the hearse to the cemetery, but it would be better to give physicians a money interest in keeping us well rather than sick. I would rather be taxed to be kept well than to be made well.

How is that done in Michigan? I believe you have in Lapeer about ten physicians. That is you pay each year

TEN THOUSAND DOLLARS TO CURE YOU

after you get sick. How much do you pay to prevent disease?

The law requires that every city shall constantly have a local board of health and provides that the common council shall be that board. So there is no possible way of abolishing a board of health. Of course the common council might pass a resolution that the law of gravitation should not work in Lapeer, but people would continue falling out of apple trees. So there is no way of abolishing your board of health. The law also requires that every board of health shall constantly have a well-educated doctor for health officer. Now I believe there are only two cities in Michigan where the health officer gets over six hundred dollars per year.

THE USUAL PAY IN A CITY OF THIS SIZE

is fifty to one hundred dollars. It has been stated today that when you had a health officer he received sixty dollars. The law requires this health

officer to report constantly to the State Board of Health, you require him to placard every house where there is a dangerous communicable disease, you require him to isolate every such case, you require him personally to disinfect every house after death or recovery, you require him to keep every case of every communicable disease in your city constantly under surveillance and then you guarantee him what? Guarantee him that by constant association with so much communicable disease he will lose some of his practice, guarantee him that his bills will be cut down one-half and that he may have to take them to the supreme court, guarantee him that he will make many enemies, and then guarantee him $60 a year. It reminds one of an advertisement which I saw not long ago in an Irish newspaper: "Wanted a live man who will undertake to sell our patent medicine. Guaranteed to be profitable to the *undertaker*." If your health officer has learned like Becky Sharpe, "how to live well on nothing a year" he may enjoy it.

Now what we pay to *cure* disease, we the people of the commonwealth pay, and yet we grudgingly pay in taxes half a cent apiece to *prevent* disease. We seem to think that because we always have lived, all money spent to prevent disease and death is money wasted. You have heard of the man who dropped his life insurance because he had kept the thing up twenty years and had never derived any benefit from it yet. That seems to be the policy of the city, the State and the national government.

While nearly every second rate power in Europe has its National Board of Health, ours has none. In 1887

CONGRESS APPROPRIATED $500,000

for the investigation of tuberculosis in cattle and of hog cholera,—more than it has ever appropriated for the prevention of diseases in man. New York State appropriated $105,000 more, Virginia, $75,000; and yet from the mere financial standpoint, all the cattle and hogs in the United States are not worth so much as the lives sacrificed each year to the diseases which we know how to prevent.

Four years ago, Edwin Chadwick commenting on an appropriation of the Spanish Legislature for equipping war vessels showed that the same amount of money expended in sanitary improvements would in ten years save over two hundred thousand lives and prevent two million cases of sickness. Such an appropriation would be hooted, and yet Spain lost more lives during the last cholera epidemic than during the great Peninsular war. In the late Crimean war 20,000 French soldiers died in battle, 75,000 died of disease. Of our Michigan boys who enlisted in the Union army during the late war, disease carried off four times as many as the fields of battle and the wounds of battle. And yet a nation which pays thousands of dollars to maintain a large standing army to protect us against those foreign foes with whom we ought to be at peace, a nation that spends thousands of dollars to study the diseases of peaches and pears, thousands of dollars to protect its fish and the young seals of Alaska has done practically nothing for the prevention of diseases in man.

Attention has been called to the fact that

YOU MAINTAIN A FIRE DEPARTMENT

to save your property from fire. Yes, we put in hook and ladder truck, hose carts, electric bells, and have horses ready to run at a moment's notice to

save our property from fire. I saw in the last annual report that the mechanical appliances belonging to the fire department of the city of Lapeer were valued at $6,000, to say nothing of the value of your buildings owned by this department. The annual expenses of your fire department are $1,500. The annual expenses of the fire department of Lansing are $6,000; and Lansing pays each year $400 to a health officer to save human life in the Capital City.

Do you remember what the British admiral said when he was accused of injuring his ship by turning it around in a time of danger? Yes, gentlemen, he replied, I did turn it around and it is injured, but gentlemen, I saw a man overboard. I wanted to save him. I did save him, and gentlemen, I consider the life of one English sailor worth all the vessels of the British navy.

This convention may cost the State and the city of Lapeer, all told, $200; but will it prevent an epidemic of disease, will it save the life of a single citizen of Lapeer? If so, then it will pay for itself ten thousand times.

DISCUSSION

BY HENRY F. LYSTER, M. D., MEMBER OF THE STATE BOARD OF HEALTH, DETROIT.

I have been quite interested in this matter of a local board of health, and I think enough has been said by those who preceded me to show that a board that is really efficacious in preventing disease is a cheap investment for a city whether large or small. It is too late when an epidemic of some contagious disease like diphtheria exists and the people are aware that the disease has prevailed and is prevailing to a larger extent than it should. Then everyone looks around for a board of health and desires protection. It would be a great deal better if a board of health were efficient and so on the lookout for diseases prevailing in other parts of the State and other states, ready to take such proper action as would prevent the disease from reaching Lapeer or spreading it if it did reach it. There is a greater work for the board of health in the prevention of disease than there is in stamping it out after it once prevails. Boards of health ought to be in communication with each other. They should be in close communication with the State Board of Health and be posted with reference to the action of the health boards of other cities. We take a great deal of pleasure here in Michigan in studying the reports of our own and other states where they have efficient health boards. Now they have in that very large city of Glasgow, a very efficient health officer, Dr. Russell, one who is known all over the world as being very efficient, and one who is doing a great deal of work in the interests of Glasgow as a health officer, and it has been wonderful how he has traced out the sources and origin of some of the epidemics of diseases, among them typhoid fever. In one instance he traced an epidemic of typhoid fever back to a place where they sold milk and where one of the children of the family had been sick with typhoid fever two or three weeks previous and where the peculiar poison of typhoid fever had been received in milk supplies that came from that milk service. In another instance scarlet fever was carried around by an individual who sold milk and who communicated it from one house to another. Now there was one instance of a celebrated health officer who was an efficient man and an excellent and eminent detective of disease.

A board of health then should be in active communication with all other health boards of the vicinity and should be looking after the health interests. It does not want to be simply a common council. A common council is fairly representative of the people. They are not any more stupid than the average majority of males, twenty-one years of age. If people are stupid enough to appoint a stupid common council we would naturally suppose them to be stupid people. As a rule common councils are hustlers, pretty good people and pretty reliable, but they are not as a rule sanitarians; not scientific in their make up and line of work, and it is only common sense that we should have a health officer who posts himself in these matters, and throw the responsibility largely upon him. I think it would be advisable to appoint a health officer on a sufficient, fair salary who would keep people informed with regard to contagious diseases and limit the amount of mortality in the city of Lapeer.

After music by Miss Nettie Johnson, the meeting adjourned.

Second Session, Thursday, March 27, at 7:30 p. m.

The meeting was called to order by the President. After a piano solo by Miss Matie Vincent, Prof. A. Arnold Clark of Lansing, gave the following address on "Disease Ferments:"

DISEASE FERMENTS.

BY PROF. A. ARNOLD CLARK, LANSING, MICH.

Two papers on the same program, the same evening, one on alcoholic ferments and one on disease ferments, remind me that the Dyaks of Borneo use the same expression to describe a man who is sick and a man who is drunk. The word they use means "possessed with evil spirits." Though we sometimes talk of "ardent spirits," and say that a man "acts like all possessed," though we still use the word "catalepsy" which means a "seizure," yet we no longer really believe that any phenomena are really caused by possession of evil spirits. Yet modern science is every day coming closer and closer to the conclusion that the process by which a man becomes sick and the process by which one becomes drunk are practically the same.

It was perfectly natural that our fathers, unable to understand the wonderful process by which the sweet, innocent grape juice turned to wine, should think that the spirits had gotten into it. But today the microscope has taught us just how the "invisible spirit of wine" looks, and we call it the yeast plant.* You have all seen yeast. Now, our word yeast comes from the German word *geest* or *gheist*, which means spirit, because our fathers thought the spirits had gotten into the yeast, and they were not altogether wrong, for yeast is not the mere mass of lifeless mud which it looks to be. Examined under the microscope, it is found to be composed of an immense multitude of living, budding, growing plants,—each so small that hundreds, placed end to end, would not reach an inch, and so light that they are found not only in the yeast cake but they adhere to the surface of the grape, and swarm in the air we breathe.

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* See Sacharomyces Cerevisiae in Diagram on page 24.

When this plant or germ enters the grape juice, like some unseen spirit, it grows and multiplies, and in its growth it has the almost supernatural power of breaking up the parts of the sugar into two substances entirely different,—a gas which escapes in bubbles, and alcohol which remains. When you can fruit, if you boil it first to kill these germs of fermentation in the can, and if you then can it up tight, to shut out the germs of fermentation floating in the air, your fruit does not ferment; and if some prohibitionist could to-night destroy all the yeast plants in the world, there would be no more wine and no more beer.

Now there are also germs which cause disease, and in the same manner that these germs of fermentation break up the sugar of the grape juice into alcohol, the germs of disease break up our body compounds into poisons—or ptomaines, as they are called—

EACH PECULIAR GERM PRODUCING ITS OWN PTOMAINE,

and each ptomaine producing the symptoms of that particular disease, just as the germs of fermentation make the alcohol and the alcohol produces the symptoms of drunkenness, and when the poison is long continued we speak of it as a disease and call it delirium tremens.

So similar are the two processes that some time ago the term "Zymotic" was applied to those diseases which are caused by a germ, because the word "zymotic" means "ferment." The difference between alcoholic intoxication and ptomaine intoxication is this: The germs make the alcohol outside of our bodies and the germs of disease make the poison inside of our bodies, so that a man sick with one of these diseases is not only being poisoned by a ptomaine produced in the same manner that alcohol is produced, but he is the vat in which the germs are fermenting.

These germs lead a very active life in their busy little world, although they are so very small that thousands can play together in a drop of water. They seem under the microscope to be as busy as bees. In their growth they form beautiful chains like this.* They spin around like a top and seem to be possessed of consciousness and to be having a good time. Dr. Kedzie describing a drop of water full of bacteria said that it looked like an animated skating rink. The biggest things about these germs are the names which have been given them. Thus this germ which looks like a mere dot is called a micrococcus, while this one which looks like a lead pencil is called a bacillus, and this one shaped like a corkscrew is called a spirillum. Then these germs have official titles which are longer. Thus this yeast plant is known among its neighbors as the Sacharomyces cerevisiæ. When these germs get to a certain length they divide in the middle, as seen in the diagram, and separate into two, and so rapidly do they multiply that it is said that in three days the descendents of a single germ would fill all the oceans of the earth, and though they are so light that Tyndall saw them dancing in the sunbeams of a darkened room, yet in a few days the descendents of one germ would weigh many thousand pounds. They do not multiply so rapidly, because in their growth they produce this poison or ptomaine of which I have spoken in which they are destroyed, just as, after the germs of fermentation have produced a certain amount of alcohol, they are obliged to stop "working" being themselves destroyed by the poison which they are producing.

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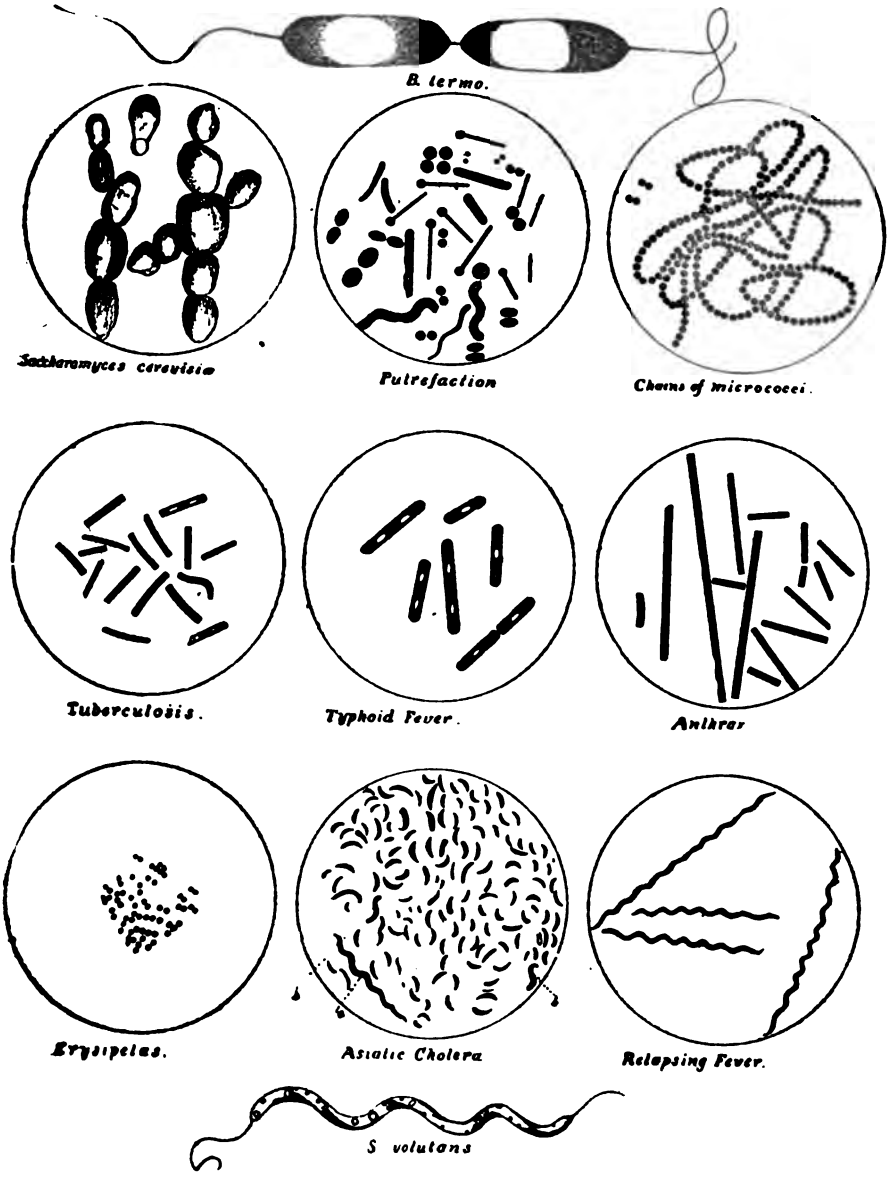
* See diagram on page 24.


B. termo.
Saccharomyces cerevisiæ
Putrefaction
Chains of micrococci.
Tuberculosis.
Typhoid Fever.
Anthrax
Erysipelas.
Asiatic Cholera
Relapsing Fever.
S volutans

I said a moment ago that the favorite soil for the germs of disease was the human body, and yet these germs can be made to

GROW LIKE THE GERMS OF FERMENTATION OUTSIDE OF THE BODY

—in blood serum at a proper temperature, in gelatine, in beef tea. And if you will go to the laboratory of hygiene at the State University you will find a long row of test-tubes or bottles, in which different germs have been made to grow. Among them you will see cultures of some germs harmless to man, such as the germ which turns milk blue, but among them there will be such labels as this: Consumption, Asiatic Cholera, Glanders, Malignant Pustule, Typhoid Fever. And if you wanted to commit suicide, you could take your choice of diseases and be sure of getting it. Or you could arrange a dozen different animals in a row, inoculate each from a different bottle and produce a dozen different diseases just so surely as the farmer can sow his farm with a dozen different kinds of seeds and produce a dozen different kinds of crops. And as the seeds of thistles always produce thistles and not corn, so the seeds of scarlet fever always produce scarlet fever and nothing else, and you can't get scarlet fever without the seed, and you can't get the seed except from a previous case of scarlet fever. These germs no more arise in the air out of nothing than do English sparrows. You know people used to think that animals originated *de novo*. Von Helmont gave a formula for the spontaneous production of mice: "Take a dirty shirt, put into it some wheat, subject the whole to heat and after a few days you will witness a transmutation of wheat into mice." These germs are little, but they are no more easily generated out of nothing than rats and mice. Bad smelling marshes no more generate scarlet fever than snakes and frogs, as the ancients thought.

Now if you went to the laboratory of hygiene, as I suggested, you would find among the bottles one labeled "consumption," containing a culture of this rod-shaped bacillus pictured here,* and if you asked where the original bacillus was obtained you would be told that it came from the

SPUTA OF SOME CONSUMPTIVE PATIENT.

These germs have been found repeatedly in the sputa and even on the walls of rooms inhabited by consumptives, where the sputa had dried upon the floor and the germs had passed into the air at every sweeping, and been deposited on the walls.

A few days ago I saw a statement that some German investigator had found the germs of consumption on the tips of cigars, where the cigars had been made by consumptives and the ends had been put in the mouth to be moistened. However, it ought to be said for the sake of the smokers that tobacco smoke is a disinfectant, and though there are constantly in our mouths a large number of germs, it has been found that there are fewer germs in the mouths of smokers than of those who do not smoke.

The sputa from consumptives has been pulverized, sprayed into the air, and dogs placed in the inhaling room and compelled to breathe these germs, have caught the disease. When Tappeiner was performing these experiments, a robust servant of forty laughed at the idea that the disease could

* See "Tuberculosis" in diagram on page 24.

be communicated in this way, and in spite of warning, went into the inhaling room, breathed the germs, caught the disease, and died after fourteen weeks. Thousands of citizens of Michigan do every day unconsciously just what this man did consciously and wilfully. And when we think of the thousands who are expectorating in our public buildings, when we think of the miscellaneous crowds sleeping in hotel bed-rooms, when we think of the close unventilated sleeping cars, it is no wonder that three thousand citizens of Michigan die each year from this disease.

This other rod-shaped germ which causes typhoid fever is found not in the sputa but in the dejections of the person sick. Thus finding its way from the vault to some neighbor's well, the disease is communicated. Let me illustrate:

Two years ago last September a young man came to this city from the south sick with what was called malarial fever, but which was probably typhoid fever. His dejections were thrown without disinfection into a vault which was only a few feet from the well. A week later a heavy rain soaked the soil and

WASHED THE GERMS INTO THE WELL,

and in two weeks his father, mother and brother were sick with the disease. In time, thirteen citizens of Lapeer were taken sick, some of whom had not entered the house, but all of whom had drank water from this well. When Dr. McColl returned from the east and was summoned to these cases he was unable to account for the illness of three mill hands two or three blocks away, but he soon learned that one day the mill pump was out of order and the hands had used the water from this well. The use of the water was stopped and there were no more cases, but in all there had been thirteen cases, all communicated from the first case.

These germs have been found in the drinking water of those sick with typhoid fever. They have been made to grow in beef broth and injected in dogs have produced a regular run of the disease in the dog the same as in man. The poison or ptomaine produced by this typhoid germ is called typho-toxine. The germs of typhoid fever make typho-toxine just as the germs of fermentation make alcohol. The typho-*toxine* is *intoxicating* like the alcohol and when injected in animals it produces the modified symptoms of the disease.

This other rod-shaped bacillus which causes that dread disease known as

MALIGNANT PUSTULE IN MAN

and splenic fever in animals has been repeatedly injected in animals producing the disease. This germ has been known to preserve its vitality after passing through the bodies of earth worms which had fed upon the carcasses of animals dead from the disease. Some time ago Baron Siebach of Saxony saw a rich growth of clover in a corner where two years before there had been buried a sheep which died of splenic fever. One night this clover was stolen, and two days later one of his tenants had a goat and a cow sick with splenic fever.

The germs which cause this disease (splenic fever) also produce a poison just as the germs of fermentation make alcohol, and the wonderful discovery has been made that when the germs are weakened and the spores destroyed and the poisonous ptomaine alone is injected in animals they have

the disease in a modified form and are ever afterward protected against an attack of the germs. How is that? Let me illustrate:

When you wish a very sweet wine or wish to keep your cider sweet, what do you do? You put in alchohol. But that is just what the germs of fermentation are themselves manufacturing. But we saw a few minutes ago that after the germs had produced a certain amount of alchohol they were obliged to stop working being themselves

DESTROYED BY THE POISON WHICH THEY WERE MAKING.

Putting the alcohol in at the start completely baffles the germs before they commence "working." It is also known that one seldom has the same communicable disease twice. Why? I believe the explanation usually accepted is that in the first attack the germs leave behind this poisonous ptomaine in which none of their kind ever afterward can live.

And here comes the momentous question why may we not yet find the ptomaine produced by each one of these disease germs and, as putting the alcohol in the grape juice stops the process of fermentation, why may we not

INTOXICATE THE BODY WITH THIS PTOMAINE,

produce the symptoms of the disease in a modified form and thus be forever afterward protected against an attack of the germ? And why may this not be done for all diseases as Pasteur has done for hydrophobia and splenic fever? And if this could be done is there any doubt that it would be the greatest achievement in the history of science? If all which a man has he will give for his life, if to be healthy is to be happy, God speed the men who in laboratory and study are prying every day more and more into the secrets of this unseen world. We honor and reward the man who saves some innocent one from drowning, but what shall we say of the Jenners and Pasteurs of history who have done so much to prolong the lives of thousands?

The time was when small-pox depopulated the nations of the earth. Time was when in a single year it swept away a million citizens of Europe and left its hideous scar on millions more. Today—though it occasionally breaks out as recently at Montreal where the ignorant inhabitants refused to vaccinate, declaring it a wicked attempt to thwart the will of God, and where in a few months there were three thousand cases,—yet today throughout the civilized world small-pox, thanks to the discovery of Jenner, is practically a disease of the past.

Every day in laboratory and study new discoveries are being made. In 1884 Löffler found in the false membrane of those sick with diphtheria a bacillus which isolated, cultivated and injected in guinea pigs produced the disease in the guinea pigs, the germs being again found on post mortem examination.* Similar experiments have been made by others and only this year there is new evidence corroborating the belief that the

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*The bacilli reproduced at the point of inoculation but were not found in the internal organs. Löffler believed that the bacillus produced a chemical poison or ptomaine at the point of inoculation which brought about the symptoms of the disease.—Mittheilungen aus dem Kaiserlichen Gesundheitsamte, Band 2, 1884.

In 1887 Löffler again reported that he had recently found the bacillus without exception in ten cases of diphtheria which he had examined. In 1888 Roux and Yersin reported concerning similar successful inoculation experiments and commented on the fact that both after death from diphtheria in the human subject and in experimental diphtheria the baccilli are found only in the false membrane. In 1889 Koliako

LÖFFLER BACILLUS

is the true cause of diphtheria, and yet so cautious are sanitarians that they are not yet quite ready to accept the Löffler germ.* But even though we may not yet have found the germ which causes this disease, there is no doubt that it is caused by a living germ which multiplies and reproduces after its own kind.

Only two weeks ago the news flashed over the wires that there were 49 cases and 16 deaths from diphtheria in the little city of Zanesville, Ohio. And then the news went on to say that the body of a little girl dead from diphtheria had been removed from Chicago to Zanesville, and the friends had gathered at the house to sympathize with the bereaved parents. The coffin had been opened that the children might have a last look at their little playmate. In less than a week the brother and sister of the little girl followed her to the grave. In another family living a block away four children were taken sick the same day, two days later two of them died, the other two followed in a few days. The brokenhearted mother contracted the disease and followed her children to the grave. The father returned from the Legislature, contracted the disease and now sleeps in the same vault with his wife and four children.

So it is not definitely known just what germ causes

SCARLET FEVER

and yet there is not a day in the week but some case of scarlet fever occurs in this State, where the disease can be easily traced to the germs from some previous case. Only two or three months ago a letter was received from Dr. Wessinger, of Howell, one of your neighboring cities, telling of an outbreak of scarlet fever in the township of Osceola, six years ago. There

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and Paltauf stated that they had found the bacillus of Löffler in about fifty cases of different forms of the disease, from which they conclude that diphtheria and croup are etiologically the same.—Report, Maine State Board of Health, 1888, pp. 249-254.

From January 1 to May 1, 1889, there were 29 cases of diphtheria in the village of Horn in the Netherlands. Messrs. Sprouck, Wintgens and Doets made a bacteriological study of seven cases in which they were able to obtain pure cultures of the Klebs-Löffler bacillus. "Rats and mice proved refractory to subcutaneous inoculation made from these cultures, which, however, proved fatal to guinea pigs and rabbits in five or six days."—*La Sem. Med.* Quoted in the Journal of the American Medical Association April 5, 1890, p. 508.

Since this address was delivered, Löffler has given the results of more recent experiments [Deutsche, Med. Woch., XVI., 81, 1890; Report, Maine State Board of Health, 1889]. In 21 examined cases of diphtheria he found the bacillus in every instance. The bacilli carried through 77 cultivations and for a period of 27 months lost none of their virulence. Dried on silken threads 48 days, their multiplication was somewhat diminished although a few colonies still developed after the germs had dried 101 days.

Dr. Escherich [Centr. für Bacteriologie and Parsitenkunde VII., 8, 1890; report, Maine State Board of Health, 1889] has recently found the Löffler bacillus in 20 out of 22 cases of diphtheria. Inoculation experiments were made upon animals with the bacilli obtained from 14 of these cases and they were all successful.

E. Klein, M. D., F. R. S., in a valuable paper read before the Royal Society, London, May 22, 1890, gives the results of interesting experiments with the Klebs-Löffler bacillus [Public Health in Minnesota, Vol. VI., No. 4]. When cultures of the Löffler bacillus were introduced in the trachea of cats without injuring the mucous membrane, acute pneumonia followed and on *post mortem* the bacilli were found in large numbers in the exudation in the large bronchi and trachea. This evidence coincides with previous observation that diphtheria in the human being is frequently coincident with a lung disease in cats.

Dr. Klein also inoculated two milch cows with a broth culture of the Löffler bacillus derived from human diphtheria. Injections were made "into the subcutaneous and muscular tissue of the left shoulder." "From one of the above cows on the fifth day, milk was received from a healthy teat, having previously thoroughly disinfected the outside of the teat and the milker's hand; from this milk cultivations were made, and it was found that thirty-two colonies of the diphtheria bacillus without any contamination were obtained from one cubic centimeter of the milk." This cow diphtheria bacillus coincided in all its characteristics with human diphtheria bacillus. The presence of the bacilli in the milk shows that the germs pass into the system of the cow. This seems not to be the case in inoculations on guinea pigs and cats.

*Sternberg says concerning the work of Roux and Yersin:

"Our authors claim that this evidence completes the resemblance of our experimental malady produced by inoculations with this bacillus, to the natural malady, and establishes the specific role of the bacillus of Klebs and Löffler. Without going quite so far as this we say that the evidence seems to us to give strong support to the conclusion."

were several cases of the disease, and after their recovery the family moved out of the house, packing the rubbish away in a back room. For six years no one lived in that house. Last December another family moved in, and on the twenty-fourth of December a child was taken sick with scarlet fever. Christmas another family visited at this house and in a few days their child was taken sick with the disease. Another family in another part of the county visited the same house, where a child contracted the disease and died, and from this family the disease was spread to others.*

So, every day in the week, cases of scarlet fever and diphtheria occur in this State, where the germs are carried in the hair and clothing, where they linger in the carpet and on the wall, where they are carried long distances by letter, where they find a hiding place in the rubbish of the garret,—as vigorous and vicious today as when they first emanated from the body of the infected person.

PREVENTION.

We have seen how these rod shaped germs, which cause consumption, are spread in the sputa from the consumptive. If this audience is an average Michigan audience, one person in every seven here to-night will die from this disease, and yet, if everywhere the sputa from the consumptive were burned or disinfected as recommended by the State Board of Health and by the American Public Health Association, none of these cases need occur.

We saw how these other rod-shaped germs which cause typhoid fever, were carried from the dejections to the water of the well. The dejections should be disinfected. But as this may not always be done, everyone has a remedy in his own hands, for it is known that boiling the drinking water will destroy these germs. This should always be done when there is any doubt about the well, when typhoid fever is in your midst, indeed it would be better to boil it always. It is more civilized to cook the water we drink. In this respect we are even behind the people of China—China, where dog meat costs more than mutton and where rats sell for ten cents a dozen, and yet in China, though they have a filthy water-supply, though they live in boats along rivers and empty their sewage into the same river from which they derive their water-supply,—yet they do not have those diseases caused by a contaminated water-supply, because they always boil the water they drink, and would no more think of taking it uncooked than we would eat uncooked potatoes.

In these other diseases which cause so many deaths,—diphtheria and scarlet fever—the germs are carried not in the water but in the air we breathe,—thus finding an entrance to our lungs. What will kill these germs? You have been told this afternoon that thousands of lives have been saved by those health officers who in outbreaks of scarlet fever and diphtheria, isolated patients sick with the disease and then after death or recovery thoroughly disinfected the house with the fumes of burning sulphur to destroy the germs lingering in the rooms. Burning sulphur has long been a good orthodox disinfectant for the next world. We now know how it destroys the little devils in this. We saw at the start how the Dyaks

*Dr. J. Brook, Surgeon, U. S. A., Fort Monroe, Va., tells of a child taken sick with scarlet fever where no previous exposure was known. Later it was discovered that one of the servants had a year previously nursed a child sick with scarlet fever. The clothing she then wore had been packed in a trunk, and only recently unpacked, the child helping to unpack it only a few days before it was taken sick.—R. I. Monthly Bulletin, Nov. 1886, p 72.

thought disease was caused by the possession of spirits. This is an almost universal belief among savages. They think these evil spirits enter the body through yawning or sneezing. To this belief anthropologists attribute the Jewish saying, "open not thy mouth to Satan;" and as a relic of this belief we still say when we sneeze, "God bless you." Naturally among savages they think that the way to cure disease is to cast the evil spirits out,* so the doctors carry little drums on which are painted pictures of devils, and when they wish to cure the patient the medicine men gather around him, one plays on the painted drum to scare the devil out, one pronounces an incantation to charm the devil out, one treads on the patient's stomach to stamp the devil out. If the devil does not kill the patient the doctor usually does. Now these communicable diseases are caused by a possession of these evil spirits,—these germs, but these little devils cannot live where sulphur is burning.

These communicable diseases, then, are the preventable diseases, because we know how to kill the germs which cause them, and yet every hour in the day there is a death in this State from one of these diseases which we might prevent.

If there are 500 persons here tonight at the average age of 45 years,

WE REPRESENT 500 OTHERS.

who 45 years ago started out with us on life's highway, and who have since joined the great majority. One hundred and fifty dropped by the wayside during the first year of life. At the close of five years 300 were gone. We strewed the path with flowers and journeyed on. At 45 only one-half the original band are here, and at the close of 95 years only two of the original thousand are left to stagger to the grave. And yet if we prevented those diseases which we know how to prevent, the average life of man would be one hundred years.

Two of the original thousand will die from small-pox, ten from measles, ten from whooping-cough, twenty-five from scarlet fever, forty from typhoid fever, sixty-five from diphtheria, 125 from consumption,—over 300 from diseases which we might prevent.

Do you remember Joseph Addison's "Vision of Mirza," where he tells how he was summoned to the mountain tops and there listened to the wonderful music of the "Genius of the Rocks?"

Cast thine eyes eastward, said the genius when he had finished playing, and tell me what thou seest.

I see, he answered, a prodigious valley, and through that valley a great tide flowing.

The tide thou seest, oh, Mirza, is part of the great tide of Eternity, but look again and tell me what thou seest now.

And Mirza answered:

I see an immense bridge which "from a cloud emerges and on shadow rests."

The bridge thou seest, oh, Mirza, is human life.

And on this "narrow bridge 'twixt gleam and gloom," they watched the long procession of humanity hastening onward.

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* The Chinese have a proverb that "idle spectators should not be present at an exorcism," because when the spirits leave the sick person they may enter the bodies of others who are standing by, and thus the contagious diseases are explained.

Come closer, said the genius of the rocks, and following where he beckoned Mirza saw that the bridge was composed of three score and ten arches, some broken, some complete. He looked again and saw that in the bridge there were innumerable trap doors, through which the passengers, long before they reached the last arch, dropped into the great tide beneath —the "dark and unknown sea which rolls round all the world." Some while pursuing "glittering bubbles," others "with eyes toward heaven in thoughtful posture," slipped and fell. While very few indeed survived the long and painful journey and hobbled at last under the last arch.

For the pitfalls and the trap doors in life we are responsible! Prevent these diseases, and the natural span of life will be one hundred arches, not three score and ten! Prevent these diseases and the way will not be a "bridge of sighs," not a rack of pain, but a golden span, on which we journey safely to the unknown shore.

Prof. H. W. McIntosh then read an able paper on the "Hygiene of Schools." This paper has not been received for publication. The discussion of this subject was led by Prof. C. E. Palmerlee, who spoke substantially as follows:

DISCUSSION OF THE SUBJECT OF SCHOOL HYGIENE.

BY PROF. C. E. PALMERLEE.

It would seem from the discussion this afternoon that very much of the public health in the city might depend at least upon the proper enforcement of the duties of the health officer with reference to this particular branch of public health in Lapeer—the hygiene of schools, it would seem to me that in the construction of school buildings, and public buildings of any kind, there should be some provision for the better heating, ventilating and care of those buildings, particularly the school buildings. I do no not know that it can be said as truly with reference to the school buildings of the city as to buildings in the country, but it is certain that not more than two of the four school buildings in this city are properly heated and ventilated, and certainly there is a question whether they are kept in the proper condition for children to stay in them the number of hours they are compelled to. The question of expense has been raised by the essayist. In the erection of school buildings in the country in times past, people were not so free to get information concerning the best plans, but now, under the direction of the State Board of Health, and with the model plans which it is considering, we may look for better results.

Concerning the question of high pressure in the public schools, it seems to me that it is true not only of the work in the city here, but throughout the union schools in the country at least. It is attempted to accomplish too much work in certain grades in the school, probably the fifth, sixth, seventh and eighth. Not time enough is given for the children to properly develop and do the more advanced wook required in the course. As it is, there is more work required in the twelve years course than can be done in that time. But a few years ago, the same course of study covered 13 or 14 years that now covers 10 or 12 years.

SCHOOL HYGIENE.

BY PROF. DELOS FALL, MEMBER STATE BOARD OF HEALTH, ALBION.

The day of the scholar has come.—The generation now passing off the stage of actual business life have made for themselves a successful career in spite of their lack of such preparation of mind as our latter day education gives; they have experienced many failures which may clearly be traced to a want of such training. To be lacking in many qualifications that mark the eductated man has been the rule, and the man who could write clearly, express himself easily and fluently, or think consecutively and logically, has been the exception.

They point back to

THE OLD SCHOOL-HOUSE,

built of logs it may be, slab seats, poorly heated but splendidly ventilated by the many openings for the ingress of fresh and the egress of foul air, the whole presided over by a schoolmaster whose special fitness for the place lay not in the extent of his literary attainments so much as upon his ability to manage the big boys, build his own fires, do his own sweeping, etc. Under such conditions, mental advancement was not very thorough nor yet very extensive. A young man learned the three R's, learned to write a little, to "cipher through the rule of three," and so presently take his place among the business men of his day.

NOT SO THE BOY OF TODAY.

His generation is being broadly and thoroughly educated and he, if he is to succeed must be as sharpwitted and as keen as anyone else. The child must be made to appreciate this and especially must parents understand that if their boys and girls are to occupy more than a mediocre place they must have the very best of facilities placed before them.

What are some of the essential requisites for a sound education?

I name as the first of these, and fundamental to all else, a sound body. Contributing to the production and maintenance of a sound body are at least three parties, all of whom must bear a share of the responsibility of causing the boy to possess a body that shall be a fit dwelling place for his higher mental aud moral faculties.

The vicissitudes of a child's life are many. Even before he arrives at the age and dignity of becoming an attendant upon school his ups and downs are various, and the wonder is that any single day should leave him with whole bones and unimpaired bodily organs. Only the constant vigilance of the mother saves him from frequent disaster and dire accident; power to help himself seems utterly wanting.

And he has not gained much self-control when the eventful day arrives and for the first time in his life he parts company with his mother and trudges off to school. During all his school life he must be cared for. Thoughtful for his own welfare he will not be. He is literally, as the politicians say, in the hands of his friends.

Unhygienic conditions in the school-room are the insidious but no less real causes of many disorders that school children are subject to, headaches, nervous diseases, nervous exhaustion, impaired eyes, and diseases

arising from improper and deficient ventilation, from insufficient or excessive heating, from uncleanly conditions, improper exercise, unhygienic clothing, and from contagious diseases. If his life is saved to him to the end of the usual eight or twelve or sixteen years, which constitute his school life, it is because parents, school officers, and school teachers have all faithfully done their duty.

WHO IS RESPONSIBLE?

School hygiene can only be successfully secured by the co-operation of these three parties. Any one of these neglecting to do what is necessary for the child's welfare, he may have a misshapen body, impaired vision, a broken constitution, and a future filled with attempts to accomplish great things but with failure written at every step.

It is proposed to note briefly the duties incumbent upon each of these parties to the child's welfare.

THE PARENTS.

Besides the obvious duty of actively interesting themselves in the public matters which pertain to the securing of proper teachers, the erection of suitable buildings, the cleaning of sidewalks during the time of deep snow, etc., the parents have much responsibility of a personal nature, growing out of their peculiar relations to the child.

No boy or girl should be allowed to go to school without being properly clothed, feet dry and warm, chest and throat protected, and body thoroughly guarded against rain, snow, excessive cold or excessive heat; a failure in any one of these particulars will bring the child to school under conditions which render it impossible for him to do any successful mental work.

The mental condition in which he starts for school is worth considering. A boy, for example, who is smarting under the sting of a sharp scolding, administered by his father or mother just prior to his leaving home, is utterly unfitted for his school work. His last words from home should be pleasant words, words of encouragement, a powerful stimulant to the best workings of his mind, more powerful perhaps than is ordinarily appreciated.

There seems to be a great deal of difference of opinion in regard to the proper age at which the child should commence his school life, and in the writer's opinion many children are started off to school when only five years of age, simply because the law allows it, when if the stage of development which the child had reached were taken into account, that act would be delayed for one or two years at least.

The fact that the brain doubles its weight from birth to the seventh year and that after that time its development has so far advanced that it grows steadily and uniformly, would seem to point to that age as a more propitious time than the legal age of five for the commencement of school life.

Again, a word of harsh criticism of the teacher, uttered in the child's hearing, is really a blow struck at the boy's mental advancement, for there is little hope that his interest in his work will be at high water mark if he distrusts his teacher. Outspoken loyalty to the school, its teacher, and its work, on the part of the parents begets a like loyalty and love for the work in the child, and this gained, he is ready to make rapid progress in his studies.

So we insist that the parent should see to it that the child is sent to school in a proper condition of body and mind, comfortable as to his body,

contented and enthusiastic in mind, in which condition he will be able to enter upon and successfully conquer all the problems set before him.

THE TEACHER.

Numberless duties in the line of sanitary science must the teacher do, many of which are apparently so trivial that in the rush and hurry of the day's business, they will be neglected unless so much study and consideration of the subject has been given to it that it becomes second nature to him to be ever on the alert lest some sanitary law shall be transgressed and some susceptible child under his care permanently injured.

To mention these points will be enough; they do not require any argument to show their forcefulness. They are, however, quite as important as duties pertaining to the mind of the pupil.

Look well to the use scholars make of their eyes: Do they sit facing the light? Is the light too strong or too dim? Are the curtains drawn when they should be raised? Are the blackboards clean? Does teacher, and scholar as well, make figures and writing large enough and plain enough for all to see without effort? Are the near-sighted scholars given a seat near the blackboard? Are the pupils given sound advice in regard to the evil practices of using the eyes too soon after rising in the morning, reading when lying down or when riding, of too severe use of the eyes after sickness, of reading with the eyes facing the lamp, or too far away from the lamp? There are other matters serious in their nature, which the watchful teacher must observe and act upon. Children need to drink often, the water they drink should be pure, should be frequently drawn from the well and not allowed to stand and absorb deleterious gases from the air. The cup and pail should be kept scrupulously clean by frequent washings. The writer would here utter a word of caution against the frequent use of common wash bowl and towel with which many schools are provided. No more effective method could be devised for the spread of a contagious disease than that several scholars should use the same towel when one, it may be, is having or just recovering from some communicable disease.

RECESS.

Recess, or no recess, is a question frequently discussed and which receives various answers. It seems to the writer that there can be but one answer, and that in favor of retaining the intermission. Recess is a time which permits the thorough washing of the air of the school room by fresh air from the outside, and also permits a similar washing of the lungs of the scholar, by which they are emptied of their load of poisonous impurities; and this will be done if the attention of the scholar is properly called to the value of so doing. But most important of all, the time and condition of the recess should be so considered that the inevitable calls of the physical nature may be responded to without hesitation, delay or embarrassment. Let plain words be uttered here in order that we may more perfectly learn our duty at a point over which gross negligence often must be written.

What may be called the vegetative workings of a child's body may be roughly divided into four parts. Food is generally eaten not many minutes before the journey to school is made. Digestion follows, requiring

from an hour and a half to two and a half or three hours, the digested products being rapidly absorbed into the circulatory system and thus distributed into all parts of the body, preparatory to the work of assimilation. Before this important work is accomplished, however, before the food can be incorporated into the tissues, the excretory organs, the kidneys, skin and lungs must do their work and cast their products from the system. If these excretory functions are interfered with, the various wastes of the system are retained and soon will be absorbed and reintroduced into the system, everywhere displacing pure blood, everywhere producing derangement and dire disorders. Bear in mind that the system demands that this excretory labor shall be done at a time about midway between the morning and the midday meals, or in other words, in the midst of the forenoon session of school. This experience is inevitable to every child, and during every session of the school. It is a law of nature from which they cannot escape if they will. Every consideration of health of body and mind demands that every possible convenience shall minister to the proper recognition of this law.

We have insisted upon a time being given for this matter; what shall be said of the place? An outbuilding situated, as many are in our Michigan school yards, remote from the building, in full view from the school house and play-grounds, the only access to it being by an unprotected walk, will not answer the purpose at all for any timid, shrinking boy, much less a gentle, quiet, modest girl will not, cannot, command the courage to go to it when they are to be observed by their playmates. Again, inclement weather and the danger from exposure to wind or rain or cold often present other evils, which more than equal those in question.

What is needed is secluded and covered walks, easy of access from the house; indeed with suitable dry-earth closets they might be built quite close to the school house and yet always with a clear space for ventilation between the two.

TEMPERATURE OF THE SCHOOL ROOM.

Is every school room in Michigan provided with a thermometer, hanging in mid-air, near the center of the space occupied by the scholars? And is the teacher guided by its registrations as to the actual temperature of the air?

Many teachers, I fear, have not advanced very far beyond the very decided stand taken by the Irish nurse who, when told to use the thermometer in order to ascertain the temperature of baby's bath, said she should do no such thing; that she knew a much better way,—"If the baby gets red, I know that the water is too hot; if he gets blue, I know that the water is too cold." The teacher should always remember that no one's body makes a good thermometer; that to maintain an even temperature of from 68° to 70° F. requires an instrument by which it may be accurately determined.

Turn now to another phase of the duties of the teacher: Mr. Blaikie, in that valuable little book, "How to get Strong and How to Stay So," says: "Probably more men walk past the corner of Broadway and Fulton street, in New York City, in the course of one year than any other point in America—men of all nations and ages, heights and weights. Look at them carefully as they pass and you will see that scarcely one in ten is either erect or thoroughly well built. Some slouch their shoulders and double in at the

waist; some over step; this one has one shoulder higher than the other, etc. A thoroughly erect, well proportioned man, easy and graceful in his movements, is far from a frequent sight. Some are so from hereditary influences, many have brought themselves to their present condition. All may improve their condition."

Take a view of the same subject from another standpoint: Dr. Chaussier, with a view of determining the cause of abnormal peculiarities in men, examined 23,200 newly born infants, and as a result of that examination made the significant statement that out of this large number only 122 were found to be abnormal in any respect, so that it was quite plain that children as a rule are straight and perfectly formed when they start for school.

Are there any facts, physiological or anatomical, which the teacher ought to hold in view as he takes these perfect bodies into his hands to manipulate them, for good or ill, for a period covering upwards of one-fourth of their entire lives? I think so. It is not enough to dismiss the subject with the very general statement that the child is given to the teacher in the plastic and formative period of life and that, therefore, there should be great care taken not to do anything harmful. Such an attitude toward the subject generally ends in doing nothing. The teacher needs to have before him definite and specific facts upon which a course of procedure may be based. For example: suppose, to punish a child, the teacher compels him to stand for an hour or more in one position on the floor; what relation does this simple and apparently insignificant incident hold to what Mr. Blaikie saw on Broadway? Much, very much. The anatomical fact needed here is this: the tibia and fibula in the lower leg, and the femur in the thigh, begin to ossify (change to bone) at from three to five centers, but *do not complete that process until the twentieth year.* That is to say, a child's skeleton during all his school life is not resisting and inflexible bone, but, on the contrary, yielding and flexible cartilage; to subject any portion of it to any unnatural strain, or for any length of time, is easily, and it may be permanently, to change its form. What is true of the bones of the leg is true of all the other bones of the body.

The great Aristotle, the father of Zoölogy, announced that the backbone of a lion was a solid piece of bone. That anatomical error has been corrected long ago, but apparently some teachers still perpetuate a like error as applied to a boy's back. A boy's back is not solid; it is made up of a hundred or more separate pieces of bone. Study Gray, that great authority on the anatomy of the human body. He says that each vertebra is formed of three primary cartilaginous portions, that some ossification takes place during fœtal life, but at birth these three pieces are perfectly separate. No marked changes occur before the age of twelve years for the girl or fourteen for the boy, except a gradual increase in the growth of these primary centers. At sixteen years, four secondary centers of ossification appear; at twenty-one years, a thin circular plate of bone is formed in the layer of cartilage situated on the upper and under surface of the centrum or body, the former being the thicker of the two. All these become joined, and the bone is completely formed about the thirtieth year of life.

Do these facts lead to a clear conception of the fact that there is serious cause for alarm in the constrained positions into which our children are forced by those teachers who love military precision more than they intelligently love the best development of the child's body, who will have order and machine regularity in their school if it is at the expense of strained and distorted skeletons? Freedom to move about, frequent changes of position,

natural postures of the body, intelligent regard for proper posture,—these are the natural corollaries of a study of the question such as has been suggested. Out of 16 young ladies, members of the senior class of a high school, seated on the stage of an opera house during their graduating exercises, only one assumed a correct posture in the chair. Only one sat erect. Analyze this case carefully and ask for the cause of this marked departure from a natural, easy and graceful position. The answer is to be found in the fact that some physiological truths have been lost sight of by both teacher and pupil. What are these facts? In the first place the body should be erect because only in this way are the internal organs kept in positions natural to themselves and in their natural relations to the other organs,—only in this way can they perform their natural functions. Can breathing and circulation, assimilation and disassimilation go on in a normal fashion? In the second place, the erect posture can only be secured and maintained by muscular action. It should be remembered that muscular action is as necessary while we are standing or sitting as when making active movements. It is to save this muscular action that the temptation comes to assume a posture as near to lying down as a chair will permit, and this yielded to again and again leads to a habit, and the habit leads to permanent deformity.

THE USE OF ALCOHOL AND NARCOTICS.

ABSTRACT OF REMARKS BY REV. J. P. FRYER, LAPEER.

In regard to alcohol, all toxicologists agree in classing it with the deadly poisons, and the administration of this potent drug should be exclusively under the control of skillful physicians. Sometimes, however, the physician's back is no sooner turned, than the friends, through mistaken kindness, are heard saying: "Keep up the system; stimulate freely," and in many instances, through mistaken kindness, they have sent the patient drunk into another world.

While alcohol is a very dangerous drug itself, it is a very good agent in chemical analysis, and I do not feel that it is right for people to continually tell us that alcohol ought to be put out of existence.

I want to say that the most dangerous form in which alcohol is presented to the public is in those patent medicines sometimes called patent bitters. I believe that that is the most dangerous form in which alcohol is presented to the people of this city. These patent medicines are often sought for as cures for indigestion, and the professional men in the medical field will bear me out that these people who are seeking after remedies will find after a careful analysis that they are partaking of gin, whisky, or of rum, and, while I shudder at the inapproachable chief of crime, strong drink, in its tremendous slaughter of people through our land, I have more respect for the man who will go out boldly and take his glass of wine, than I have for the man whose appetite is stronger than his temperance principles, and who is found partaking of strong drink under the label of bitters.

A STUDY OF THE ACTION OF ALCOHOL ON THE HUMAN BODY.

BY PROF. DELOS FALL, M. S., MEMBER OF THE STATE BOARD OF HEALTH, ALBION, MICHIGAN.

The special work assigned to the writer, as a member of the State Board of Health, is school hygiene; and it is in furtherance of that work that the following paper is offered. Its purpose is two-fold: (1) to present some of the facts concerning the action of alcohol upon the various tissues of the human body; and (2) to illustrate a method of approach and treatment of the subject such as may be used by teachers who have under their instruction scholars of the grade usually found in our grammar and high schools.

Before proceeding with the subject certain conditions will be insisted upon which, according to the opinion of the writer, are quite essential to the proper enlistment of the scholars' interest in the subject:

(1) The teacher must lay aside all sentiment, both in manner and in words. This subject demands the same cold, critical, scientific treatment that every other question in science receives. For the teacher to have it known that he treats this subject simply from the standpoint of a political prohibitionist or ardent temperance worker would be to so prejudice the work as to largely destroy the results which are aimed at.

(2) On the other hand, the scholar himself must have passed beyond that stage of his observation of the results of rum's doings that simply makes sport of the drunken man, deriving pleasure and making such a man serve as the occasion for fun and frolic. It would be well if the scholar should set himself the task of seriously and carefully observing for himself those facts which are apparent when he comes face to face with one of the victims to the alcohol habit. Let the scholar note, then, the staggering gait, the rolling eyeballs, the bleared and blood shot eyes, the voluble tongue, the rum-blossomed nose; the loss of judgment, of honor, of purity; the drunken stupor, etc., etc., and with his mind full of these facts he will be in a condition to heartily appreciate the work set before him.

Can the real, the scientific reasons for this condition of things be understood clearly by the pupils in our schools? It will be our aim to show that this can be done.

What is the action of alcohol on the system?

This question naturally divides itself into two parts which must be treated separately.

The first concerns those investigations which will make plain the merely physical action of alcohol on the body; the other those considerations which reveal the value of alcohol as a food.

ALCOHOL MAY BE INTRODUCED INTO THE SYSTEM

in several ways; it may be injected through the skin, it may be inhaled by the lungs, or it may enter the stomach by means of the mouth. By all these methods the alcohol will finally make its way into the circulation and by it be distributed to every part of the body. If injected under the skin or into a vein it is quickly absorbed by the minute lymphatics and by them passed into the circulation at the point where the great vein from the arm, the subclavian, joins the vein in the neck, the jugular, thence into the descending vena cava, and onward into the heart.

If the alcohol is in a state of vapor and inhaled by the lungs, osmosis quickly takes place, and the alcohol passes from the air-cells into the pulmonary capillaries and is by them conducted to the pulmonary veins, and thus on to the heart.

But the usual avenue of ingress into the body is by way of the mouth and stomach. Portions of the alcohol are here quickly absorbed by the dense matting of blood capillaries lining the mucous membrane of that organ and by them passed in to the great portal vein leading to the liver. Passing through this it makes its way into the ascending vena cava, the right heart, the lungs, back to the left heart, and thence through the aorta and its divisions into all parts of the body. Thus it is seen that this fluid finally comes in contact with every organ of the body, it bathes every tissue, it lays tribute upon every nook and cranny of the human system.

Having now studied the course of the blood and hence the alcohol through the system, let us pass on to inquire as to the effects which are produced on the various tissues and organs with which it comes in contact.

ACTION ON THE BLOOD.

Plainly among the first things to be influenced will be the blood itself. If the alcohol is in small quantities it may be diluted to such an extent by the large percentage of water present in the blood as to render it powerless to affect any visible change in the blood. But its effects when in large quantities, as it exists in the blood of the confirmed drunkard, are well-known.

In order that we may clearly understand what this action is we must recall the structure and component parts of human blood.

It will be remembered that the blood on first examination is seen to be composed of a clear, watery fluid, the plasma, and floating in this, myriads of small, round, biconcave bodies, the corpuscles. The plasma is in turn composed of albumen, fibrin,—which aids in the process of coagulation—fatty matters and salts of several metals. Now, various experiments have been made, such as administering alcohol to a frog and observing the effect on the blood as seen in actual circulation in the web of the foot, or withdrawing blood from the veins of a man in the state of intoxication; so that the pathological effects are well known.

The action of the alcohol upon the corpuscles is very striking. It may cause them to roll together closely and continue to adhere, a condition never seen until the blood has begun the process of coagulation.

Here is our explanation for the sluggish flow of the blood in the capillaries of the drunken man, the corpuscles not being able in the closely adhering rolls to make their way through these minute circulatory organs.

Moreover the corpuscles are seen to have their outlines modified, making their smooth and regular outline to be wrinkled and the whole form star-like. These changes are brought about by the power which alcohol has of absorbing or extracting water. We are familiar with the power which a sponge possesses of accommodating great quantities of water between the particles of its own structure. A cloth or piece of paper will do the same. We are not so familiar with the same effect produced by a liquid, but alcohol and some other liquids possess it in a high degree. It is on this principle that specimens for our museums are preserved, which otherwise would be perishable on account of the large amount of water they contain. They are plunged into a jar of alcohol, the water is thereby withdrawn and

the specimens preserved. We are now prepared to clearly understand one action of alcohol on the system, viz., alcohol withdraws water from the blood corpuscle and thus shrinks and hardens it, rendering it wholly unfit to carry out its natural functions of absorbing oxygen and conveying it to the various tissues of the body.

As to the action of alcohol on the liquid portions of the blood I quote from Dr. B. W. Richardson:

"A further action upon the blood instituted by alcohol in excess is upon the fibrin and albumen. On this the spirit may act in two different ways, according to the degree in which it affects the water that holds the fibrin in solution. It may fix the water with the fibrin, and thus destroy the power of coagulation; or it may extract the water so determinately as to produce coagulation. These facts bear on a new and refined subject of research with which I must not trouble you further, except to add that the inquiry explains why in acute cases of poisoning by alcohol the blood is sometimes quite fluid and at times firmly coagulated in the vessels." *

Let us now pass to the study of the

ACTION OF ALCOHOL ON THE BLOOD-VESSELS.

As before, we must have before our minds a clear conception of the structure and functions of these organs.

Picture then, each for himself, the heart, the central circulatory organ and force pump of the system, an organ of small dimensions but of great power, situated in the lower part of the chest; from this arises that great artery, the aorta, which in turn divides and subdivides until portions of it have ramified into all parts of the system as if indeed these organs formed the framework round which all the rest of the body was disposed. These arteries as they have thus divided and subdivided have continually grown smaller and smaller until they terminate in a set of minute organs so small as only to be visible by the aid of a microscope, the capillaries. These in their turn open into the small beginnings of the veins which, ever enlarging, finally convey the blood back to the heart itself.

These capillaries, small as they are, are very highly organized and have clearly defined functions. They are muscular and in common with all muscles have the power to contract; by this contraction aiding to force the blood along in its passage through them.

And it must not be forgotten that these organs, small and refined as they are, are not left to chance as to the time or force of their muscular contractions, but are as efficiently and constantly governed in their movements as any organ of the body; that is to say, for every portion of every small capillary there is a nerve which supplies the proper stimulus at the proper time for its action. This necessitates a brief

STUDY OF THE NERVOUS SYSTEM.

If we study the anatomy of some of the lower animals, as the earth-worm or grass hopper, we shall find that for every segment or division of his body there are two small masses of gray nervous matter constituting for that segment a double brain for its proper governance and control. Proceeding outward from these ganglia are nerves running into all parts of the segment. This constitutes the entire nervous system of the lower animals,

* Ten Lectures on Alcohol, p. 78.

and in man we find exactly the same thing except that besides this, he, in common with all vertebrated animals, has superadded another great nervous system, consisting of brain, spinal cord, and the cranial and spinal nerves.

I have thus characterized what you are all doubtless familiar with, the two nervous systems found in man, united to each other and yet very distinct from each other, both structurally and functionally. The former is the sympathetic and the latter the cerebro-spinal system. It is the sympathetic, or as it is sometimes called, the organic or vegetative system, in which we are now particularly interested, as it is this system which governs the capillary blood vessels. Now the great harm produced in the blood vessels by alcohol comes to them through its action on these nerves. What the action is may be understood by

AN EXPERIMENT.

If I place some ether on my hand and cause a current of air to pass over it, it quickly evaporates and chills the skin. My hand thereby becomes numb or paralyzed, the nerves distributed to that part having been thus affected by the ether. Notice what follows: the nerves being no longer able to act, the capillaries will not contract and hence become permanently enlarged. This super-abundance of blood renders it hot and inflamed. Blushing and pallor in the face are to be described in much the same way. Ether is chosen in this experiment because its action is more rapid and more marked than alcohol. The latter produces the same results only differing in degree, and the experiment has therefore correctly taught us the action of alcohol on the small blood vessels, and we are now prepared to state what that action is, viz.: alcohol paralyzes the nerves distributed to the capillary blood vessels and they thus become abnormally dilated with the flowing blood. In connection with the foregoing, one fact should be kept in mind, and that is, that the phenomenon here described is brought about with the introduction of even a moderate amount of alcohol.

The action of alcohol does not stop here. The disturbance of equilibrium in the capillaries produces an

INCREASE OF THE HEART BEATS.

The heart when the circulatory apparatus is in its normal condition meets a certain and uniform resistance which tempers and times the rate of its pulsations. When the capillaries become permanently enlarged, in consequence of the paralysis of the organic nerves, the heart must increase the number of beats in order to meet the new demand. Thus like a clock, from which the regulating pallets have been removed, the beat of the heart is faster and faster as long as alcohol is introduced within the body.

The rate of increase of heart beats has been carefully and accurately computed and found to be an average increase of about 13%, or, adopting another form of putting the case and quoting again from Dr. Richardson,* "The lowest estimate which has been given of the daily work of the heart, viz., as equal to 122 tons lifted one foot high, the heart during the period in which alcohol was administered, did daily work in excess equal to lifting 15.8 tons one foot, and in the last two days did extra work to the amount of 24 tons lifted as far." Moreover,

* Ten Lectures, p. 87—Researches of Dr. Parkes.

THE PERIOD OF REST OF THE HEART WAS SHORTENED.

We do not ordinarily think of the heart as needing or taking any rest, but like all other parts of the human mechanism it must have rest or finally its powers are gone, it flags in its action, and finally will wear out altogether.

Let it be plainly and emphatically enforced that the conditions and effects here described are those consequent upon the first introduction of alcohol into the system. It may be called the first stage in the alcoholic effects.

Let it also be enforced that these external phenomena of flushed face and more rapidly beating heart are but the signs of a serious derangement which is being accomplished all over the system. The young man is apt to think and act as though these were all the evils accomplished and that these would easily and quickly right themselves. This is not so: if the lungs could be seen they would show the same unnatural injection of an oversupply of blood, the brain and spinal cord would be seen to be surcharged with blood; the liver, kidneys, spleen, the stomach, would all show the same unnatural condition. Just here the greatly increased thirst of the drinking man can easily be understood. This enlargement of the capillary blood vessels all over the system calls for more blood than the system contains or can supply, and the supply is made up by an excess of liquids of various kinds. By this the blood is thinned and impoverished and the system degraded.

IN THE NEXT STAGE

the spinal cord comes under the blighting influence of the alcohol and its functions become impaired. The spinal cord has a dual function; it not only conveys impressions received through the nerves to the brain, but it also frequently arrests them and transmits back the impulse for motion necessary for the carrying out of some of the minor movements of the body. For example, I may walk along the street and at the same time carry on an animated conversation with the friend who accompanies me. Now, every movement of the foot is brought about only when the proper impulse has been given it through the nervous system. Plainly, if the brain were obliged to attend to each movement of the foot, there would be no time for accurate thinking or coherent conversation. Physiologists have learned, then, that the spinal cord has the important function of reflex action by which certain minor matters are relegated to it, leaving the brain free for the higher duties. But under the action of alcohol these spinal centers finally become so deranged that they are not capable of correctly bringing about these automatic acts. More and more the commonplace acts of walking, the use of the hands, the movements of the muscles of expression, the muscles controlling the eyes, etc., all of which should be governed by reflex action, require the action of the brain itself. This unnatural taxing of the brain quickly results in

A LACK OF THE POWER OF COÖRDINATION

of the movements of the body. It is said "that the muscles of the lower lip in the human subject usually fail first of all, then the muscles of the lower limbs." In the meantime the muscles are becoming weak and flabby, and slow and feeble in their action. The staggering gait and wretching and vomiting close another stage of alcoholic effects.

A third stage quickly follows in which the brain centers themselves becoming overtaxed, the will and judgment are temporarily dethroned, the higher and finer feelings give way to the baser passions, the naturally pure man becomes a defamer of his God, otherwise truthful lips give forth vile and false statements, the normally brave and courageous condition is exchanged for that of the foolhardy and irresolute, foolish words and ribald songs are the natural outgrowth of the man's condition.

The alcoholic appetite further indulged and its victim passes into

THE FOURTH AND LAST STAGE

in which he loses all control of nervous and muscular organs and falls down dead;—to all that makes him a man, actually dead with the exception of the faithful heart which ceases not its beating and hence prevents life itself from being dethroned.

But we must leave the consideration of the merely physical action of alcoholic drinks on the system for the discussion of another very important phase of the subject. We do not stop however, because of lack of material. It is a large subject. Every part of the body is diseased by this fell poison and every organ is affected in its own peculiar manner. So we have the hob-nailed or gin-drinker's liver, the fatty heart, the ulcerous stomach, the dropsical abdomen, the poisoned kidneys, giving rise to Bright's disease, the aneurism of the blood vessels, the congested lungs, etc. But the limit of this paper makes it altogether impossible to more than mention the names of diseases often the direct result of drunkenness,—dyspepsia, jaundice, emaciation, corpulence, dropsy, ulcers, rheumatism, gout, tremors, palpitations, hysteria, epilepsy, palsy, lethargy, appoplexy, melancholy, madness, delirium tremens, premature old age, etc., etc.

Is there any compensation for all this? I have reserved for myself a large part of this paper for the discussion of this question. The question is sometimes answered in the affirmative. When so answered it has been on the basis of the statement that in all alcoholic beverages there is a certain amount of nutrient matter, that is that alcohol is a food.

IS ALCOHOL A FOOD?

This brings us to the very heart of our subject, the pivotal point around which the great discussions have raged. All have conceded that dire and dreadful results have always flowed from an excessive use of alcoholic drinks; but after all is there not a moderate use of them possible, so moderate that the beneficial results will more than compensate for the few evils which necessarily accompany them?

In order to prepare ourselves for the discussion of this subject it will be necessary to briefly review the character and uses of food. The various foods we use may be primarily divided into inorganic and organic. The former will include those few mineral matters which the body of man seems to have the power to assimilate such as water, common salt, salts of calcium, magnesium, potassium, etc. Organic foods may be divided into three classes, the albuminous such as the white of the egg or the fibrin of meat, the saccharine or the starches and sugars, and the oleaginous or fats and oils. If we go further and consider their chemical composition we notice that while the saccharine and oleaginous foods contain but three elements, viz., carbon, hydrogen, and oxygen, the albuminous foods all contain a fourth element, nitrogen. This permits another classification and one which it is very important for us to remember. The organic foods are

divided chemically into two classes (1) the nitrogenous including the albuminous food and (2) the non-nitrogenous, including the saccharine or the sweet foods, and the oleaginous or fat foods. Every particle of food, then, which we daily pass into our mouths,—bread, butter, meat, potato, pie or cake, all contain some nitrogenous and some that is non-nitrogenous.

THE USES OR FUNCTIONS OF THESE FOODS.

As alcohol is clearly of organic origin it will, for our present purpose, only be necessary to ask after the uses of the organic foods. These foods then are introduced into the body for three general purposes, viz., (1) to build up tissues and repair waste, (2) to produce heat, and (3) to produce energy. But since heat is only a form of energy we may combine the two uses last mentioned into one and condense our statement into this: food is anything which is needed in our bodies for the two general purposes,—tissue forming and energy producing. Take notice, however, "that to the above definition should be added this important condition that, neither the substance itself nor any of the products of its chemical transformation in the body shall be injurious to the structure or action of any organs, otherwise it would be a poison not a food."* In the light of these definitions let us examine alcohol. First, then,

CAN ALCOHOL BUILD UP TISSUES?

We answer that in the case especially of the more important tissues, nervous, muscular and glandular, alcohol cannot contribute to their growth. The reason is a chemical one but I trust this will not discourage you from fully appreciating it in all its force. The chemistry involved is very simple and can be grasped with ease by all. The briefest statement of the argument is, alcohol cannot build up muscular, nervous or glandular tissues, because it contains no nitrogen. These tissues are nourished mainly by the nitrogenous or albuminous food. Alcohol contains only carbon, hydrogen and oxygen,—its chemical formula being $C_2 H_5 O H$. What are these tissues? They are those which contribute the forces and activities to the body, the capability of motion either of the body as a whole or any of its parts. What is the secret of their forceful nature? The secret of their forceful nature is the nitrogen which they contain. Remembering that chemical action and chemical principles are the same everywhere we may borrow an illustration from inorganic chemistry to throw light on the statement just made. Gunpowder as you know is a mixture of charcoal, sulphur and potassium nitrate or saltpeter. In this mixture the charcoal and sulphur are used because of their easy combustibility, the saltpeter because it contains a large quantity of oxygen and also because the oxygen is in combination with nitrogen. This latter element is weak in its power to attach itself to other elements and when so combined its inertness renders it very willing to part company with them; that is to say, any compound containing nitrogen tends to be easily broken up. If now there is also present other elements which when first separated and then recombined produce large quantities of gaseous compounds and if these gases be confined so that they can not freely escape, the result will be that great force or energy is developed. This in brief is the explanation of the force exerted by

* Martin's Human Body, Advanced Course, p. 298.

gunpowder. Now, muscle and nerve must possess some of the properties of this gunpowder, that is, in order that the processes of disassimilation and assimilation shall go on rapidly they must be so constituted that they are easily and quickly decomposed and they must also be of such a nature as to yield a large amount of oxygen. The point I wish to emphasize and call particular attention to is that the initial movement for the whole series of phenomena is due to the nitrogen present; gunpowder, dynamite, nitro-glycerine contain nitrogen and hence their forceful nature. Muscle, nerve and gland contain nitrogen and hence their power to set into being those forces which give to the human body life and activity. I think we can now fully appreciate the weighty argument contained in the statement that alcohol contains no nitrogen and hence can not build up these tissues. We must go farther however before this argument is complete. Do not these tissues contain carbon, hydrogen and oxygen and may not alcohol contribute these while the nitrogen is drawn from some other source? Just here must be brought into view a fact in regard to the human body which is well known by physiologists and which compels us to answer the question in the negative. The fact here alluded to is

THE LIMITED CONSTRUCTIVE POWER OF THE HUMAN BODY.

Plants have marvelous constructive powers, they being able to take the elements as combined in minerals or uncombined as the case may be and work them over, thus reconstructing them into likeness with their own tissues. Not so in the animal world. Animals must have their food already prepared in that form which if not exactly like their own tissues is yet so near that it comes within the limit of their feeble powers to metamorphose them. The human body cannot, then, break up alcohol and recombine the elements into nerve or muscle or gland. In order that to the product of our own reasoning on this point and the conclusion we have come to, there may be added the weight of some high authority on the subject, I will quote again from Dr. Richardson the great English experimenter and investigator on this subject. He says, "Alcohol contains no nitrogen, it has none of the qualities of the structure-building foods; it is incapable of being transformed into any of them. It is therefore not a food in the sense of its being a constructive agent in the building up of the body." He adds this significant statement: "In respect to this view, there is, I believe, now no difference of opinion among those who have most carefully observed the action of alcohol." *

But it is said that "beer drinkers grow fleshy." Yes it is true that although alcohol cannot contribute to the growth of tissue it does have the baneful power of changing otherwise healthy tissue into an unnatural fatty material and depositing it in places altogether abnormal and decidely prejudical to the welfare of the body. It changes the connective tissue of the heart, for example, into fat and hence results the well known disease

FATTY DEGENERATION OF THE HEART

which finally produces death. I cannot now stop to discuss this phase of the subject but will dismiss it with the well known scientific statement that fatty degeneration of tissues and the deposit of this fat in unnatural places frequently if not always accompanies the use of alcohol.

* Ten Lectures, p. 100.

Besides, there is a converse side to this question which has already been incidentally brought out and that is that not only is alcohol not itself digested and assimilated but it coagulates the albuminous foods and in this way retards the digestion of these important food elements. In fact there is no disease more frequently brought to the attention of practicising physicians than is drunkard's dyspepsia. Indigestion is an almost universal accompaniment to the alcohol habit.

Still again let us try alcohol by some of the general tests for food and because I find them stated exactly as I want them in that splendid work on the subject, lately published, Gustafson's "Foundation of Death" p 68. I quote his words;—

"1. The regular foods are essential to life. It is positively proved that alcohol is not essential either to life or health.

"2. The periodic need felt for regular foods ceases each time after being moderately supplied; even the momentarily importunate demand (caused by some special want), when satisfied, also ceases, or, if satiated or persistently denied, may even change to aversion.

"With alcohol, the desire, if steadfastly denied, will gradually cease, but if satiated, it begets abnormal craving, and the craving, having once taken hold, becomes the most insatiable of human passions. As Linnæus said, 'Man sinks gradually by this fell poison; first he favors it, then warms to it, then burns for it, then is consumed by it.'

"3. Regular foods, when taken in their proper ratio, are easy of digestion, and give the system a calm increase of vigor. Alcohol deranges digestion and disturbs the action of nerve-tissue."

This author adds, "To judge from these tests therefore, alcohol is not only not a regular food, but, if used as such, acts as a poison."

There still remains one important inquiry concerning the food value of alcohol.

IS ALCOHOL A HEAT OR ENERGY PRODUCER?

If we should make the appeal at this point to those who use alcohol in any amount the testimony would be almost universal that it was capable of producing heat which is felt at once and is unmistakable. We meet here one of the most deceptive phases anywhere to be noticed in connection with this subject. We have already seen how the capillaries are distended with an unusual amount of blood producing a congested and inflamed condition. This is especially true of the capillaries of the skin. Here in these capillaries it is that evaporation is possible and here it is that the nerves of the temperature sense are located.

Two results follow from this condition:

1. An unusual amount of heat is required to carry on this evaporation, which heat is drawn from the interior of the body. The temperature of the body as a whole, therefore, is lowered instead of raised.

2. This heat thus escaping to the surface there comes in contact with the temperature sense nerves, and produces that glow of warmth which is so quickly manifest on the face and skin as soon as alcohol has been taken. It is an increase of heat only on the surface and that but for a short time and at the expense of internal heat. This is very significant when we remember that "the functions of life are greatly affected by even slight thermal changes, and only a few degrees below the normal will extinguish life; therefore anything which causes great fluctuations in bodily heat is dangerous to health and life."*

*Foundation of Death, p. 95.

But, we must still inquire, may not the alcohol be oxidized in the interior of the body and thus be a source of heat? It is a familiar fact that the temperature of the body is maintained by the union of the oxygen with the tissues, these tissues serving as the fuel for the production of bodily heat. Alcohol, as is well known, is a highly combustible substance and may it not serve as the fuel? Just at this point the scientific world is divided, some maintaining that the alcohol is broken up and others that it passes through the body unchanged. We must examine both aspects of this question. That not all the alcohol introduced into the system is changed is proven by the well-known and characteristic alcoholic fumes escaping from the drunkard's body through the exhaled breath, his skin and by other channels. A certain amount of alcohol has been found in various parts of the body of persons who have died in an intoxicated state.

John Guthrie in his Temperance Physiology quotes the following from the statemeut of Dr. William Beaumont as to a post-mortem examination;—"I dissected a man who died in a state of intoxication after a debauch. The operation was performed a few hours after death. In two cavities of the brain, the lateral ventricles, was found the usual quantity of limpid liquid. When we smelled it the odor of whiskey was distinctly perceptible, and when we applied the candle to a portion of it in a spoon it actually burned blue. The lambent blue flame characteristic of the poison playing on the surface of the spoon for some seconds."* Of this alcohol thus passed unchanged into all parts of the system we say that even if it had no poisonous or evil effect on the various tissues and organs it still would be an evil as being so much foreign matter occupying the place which should be filled by nutrient matter and sound tissues, in this way acting as a clog or hindrance to the normal operations of the system. But we have seen that it is extremely poisonous to everything with which it comes in contact. Suppose we found that the bread or potato we were eating passed through the system unchanged, that the digestive juices were incapable of decomposing them, how long would it be before we should reject them from our dietary. Especially would we do this if we found that they were both indigestible and poisonous. If on the other hand we grant that much of the alcohol is oxidized, it can scarcely be said to mend matters very much. Looking simply at the neccessity existing for maintaining the bodily temperature at a fixed point and finding that alcohol served as fuel to produce that temperature, one would be inclined to say that here at least we find this liquid performing a useful office for us. There is a fact, however, which lies behind this oxidation and heat production which must be considered. Oxidation takes place not alone that heat should be developed but also in order that by this process old tissues may be removed to make way for the assimilation of fresh food material, the health and activity of the body depending upon the processes of disassimilation and assimilation following each other in rapid succession. We live well only as we daily and momentarily die well. Tissues can only be quickly built up as they are quickly removed. Now the agent for this removal is oxygen; the process, oxidation or burning. We are now prepared to state the strong argument against claiming any food value for alcohol, viz., if oxygen is used to burn alcohol, some tissues which ought to be removed from the system will fail to be so removed for want of that oxygen.

The explanation of many conditions of the drunkard's body are now made clear to us; the bloated condition, the weak and flabby muscles, the blood-shot eyes, the discolored skin, the putrid breath, the sickening emana-

*Foundation of death. p. 93.

tions from his entire body, all are indications of the awful condition of his entire system due to the withdrawal of the efficient and necessary oxygen from its legitimate work of removing waste and worn out tissue.

I have not considered that it was within my province to quote authorities to any extent, but rather to give reasons for the truths we desire to teach the children in our schools, but just at this point one or two such words will have great weight; Dr. Hooker, physician of the Arctic expedition under Sir John Ross, says: "When a continuance of exertion or endurance of cold is called for, alcohol does harm; for you are colder or more fatigued a quarter of an hour after taking it than you would have been without it."

Prof. Miller states that the Russian military authorities "interdict its use absolutely in the army, when troops are about to move under extreme cold; part of the duty of the corporals is to examine carefully the breath of each man on the morning parade, and to turn back from the march those who have indulged in spirits, it having been found that such men are peculiarly subject to be frost bitten and otherwise injured."

On his return home, Lieutenant A. W. Greeley, Commander of the Jeannette Arctic expedition, said that he intended as soon as his health was restored to give to the world the results of the experience of his party in the use of alcohol in the Arctic regions. The August, 1887, number of the Forum contains the promised article, "Alcohol in High Latitudes." Some very interesting facts are brought out about his own expedition as well as of others to the same regions and he sums up his conclusion as follows:

"It seems to me to follow from these Arctic experiences that the regular use of spirits, even in moderation, under conditions of great physical hardship, continued and exhausting labor, or exposure to severe cold, can not be too strongly deprecated."

On the other hand Henry M. Stanley testifies that the value of alcohol to fit one to endure the effects of a tropical climate is of a negative character, that it rather unfits one for a long march under those conditions.

It would seem that if alcohol is necessary to the human system at all it certainly ought to be in those extreme temperatures at the equator and the poles, which put so serious a strain upon the vitality of those unused to them. But Stanley's testimony to the folly of liquor drinking in the tropics is similar to Gen. Greeley's emphatic condemnation of it in the Arctic regions.

Just a moment for a brief recapitulation of the points of our indictment against alcohol:

1. It deranges and oftentimes destroys the blood corpuscles.
2. It coagulates the albumen and fibrin of the blood.
3. It paralyzes the organic nerves distributed to the blood capillaries and produces congestion and stagnation.
4. It destroys the natural functions of every organ in the body.
5. It gives rise to an almost innumerable train of evils and diseases peculiar to the alcoholic habit.
6. It can not build nervous or muscular or glandular tissue.
7. If it does produce heat and energy it thereby leaves unburned tissues in the system that ought to be removed.
8. It unfits the system to endure cold as its use in the end decreases the bodily temperature.
9. It equally unfits one to endure the heat of summer.
10. It is a poison.

Henry F. Lyster, M. D., member State Board of Health, being called upon, spoke substantially as follows:

REMARKS

BY HENRY F. LYSTER, M. D., MEMBER STATE BOARD OF HEALTH, DETROIT.

(Reporter's Abstract.)

I have been very much interested in all that has been said and I think you will find that the strongest temperance sentiment in the State is that which pervades the State Board of Health. I quite agree with the scientific teaching in the schools of this subject of the physical influence of alcohol. I for one believe in this scientific teaching in the schools, as Prof. Fall has advocated. There are other places and other conditions where the sentimental side may be presented, and there is not much danger that it can be overdrawn.

As chairman of the committee of the State Board of Health on the subject of alcoholic liquors, I have taken a great deal of interest in this matter, and I quite agree with the most advanced temperance people that the great blot on our civilization is the consumption of alcoholic liquors.

I think that we can attribute to the consumption of alcoholic liquors a great many of the evils from which we now suffer. The civilizations of the time, in my mind, would be greatly in advance of their present condition if it were not for the use of alcoholic liquors. In the case of some workingmen there is so little margin, the line is drawn so closely that if he stops work for a single day or single week his family suffer, when he should be able to lay up a certain portion of his daily wages in educating his children. Now the idea of taking care of those dependent upon us is being undermined and subdued by the use of alcohol. You will find that the laboring man is ground down, and one of the things that keeps him down is the use of alcoholic liquors.

The family also is contaminated, and in what manner? Where are the rights and privileges that should come to them from this relation? Spent in alcoholic drinks. Suppose one-fourth of a community use alcohol, three-fourths of the community never taste alcohol. One-fourth of the community say are consumers of alcoholic liquors, and the average amount that they can consume in this United States is nearly 5 gal. of distilled liquors per head and 43 gal. of beer or malt liquors and wine per head. Can you appreciate the disastrous effects of the use of these liquors? From a moral point of view everyone condemns them, and we find the clergy arranged a solid phalanx on this question. Sometimes misunderstood, but as a body the clergy has come out nobly in the cause of temperance.

From a medical point of view, there is something to be said in favor of alcohol, but the more we know about medicine, the less becomes our appreciation of the value of alcoholic liquors. A fresh drawing of tea, or a little beef tea, nine times out of ten, is a better stimulant than alcohol. We condemn alcohol in treatment as a rule. It is very seldom that it is of great service, and it is given less and less every day by the medical profession.

Third Session, Friday, March 28, at 9:30 A. M.

After an instrumental duet by Misses Jean Hamilton and Flora Roberts, the following paper was read:

THE PUBLIC PRESS AND THE PUBLIC HEALTH,

BY JEREMIAH LYNCH, LAPEER.

The public press stands in nearly the same relation to the people as a public officer. The duties of each when honestly and properly performed are beneficial to the public. It will be readily seen that the press, by reason of its general distribution among the people is the best available medium we have for the dissemination of necessary information. It is very essential that the people be informed generally of the best means for the prevention of dangerous diseases. The people buy newspapers for the valuable and useful information they contain. Information on sanitary matters is valuable. The people therefore have the right to require that it be given through the columns of the press for the benefit of the public health. The editors of the Lapeer press, generally speaking, have been willing to aid and assist in the advancement of every public enterprise. We have, therefore, some assurance of their co-operation in this matter of sanitary reform, and I would suggest to the convention and the press the feasibility of setting apart a column to be known as the health column. In this column the public might be kept informed concerning sanitary matters generally. Here the secretary of the local board of health might report such matters as came under his observation. When any dangerous or contagious disease makes its appearance, let it be promptly reported in this column. Also what measures should be taken to prevent the spreading of the disease, what disenfectants should be used in each case, etc. The editor should be provided with a proper supply of documents treating on sanitary matters. Such information will be readily and cheerfully furnished by the State Board of Health. In this way the editor would at all times be provided so that when a dangerous communicable disease makes its appearance anywhere among his patrons he could give them at once proper information on the subject of the disease or epidemic—what disinfectants should be used. All reporters of the papers should be required to report correctly the outbreak, in their midst, of such disease. Whenever a cause or condition is observed which is likely to breed distemper or disease, let it be reported in the health column, and the attention of the authorities be called to it, so that the cause of danger may be removed and proper conditions restored.

This, it seems to me, would be an orderly and quite proper way to approach the subject. The man who buys a newspaper and pays his money for it has a right to demand the best article that can be provided, and the editors will readily provide such information on sanitary matters if there is a demand for it. Editors are quite likely to furnish that article of merchandise which is in highest demand. We find that in our midst a condition of affairs has been in existence for a long time, that is without a parallel. We find that long ago our common council, in the exercise of its plenary powers, abolished the Lapeer Board of Health and has itself neglected to perform the functions of that body. While it must be conceded

that this is a great misfortune, yet strange as it may seem, the matter has entirely escaped the notice of our press. We read in our city papers the reports of all the proceedings of our courts, but we are denied the very poor privilege of reading an account of the proceedings of the common council. We do not know what that august body is doing with the people's money. We do not know whether more of the public funds is being expended in a manner to enhance the value of some alderman's property, or in cleaning the allies of the city for the general benefit of the public health. During the heat of midsummer, large heaps of refuse matter nearly as large as the buildings themselves, may be found near some of our barns and livery stables steaming and fermenting in the heat of the sun, a nuisance in the community, and no one takes the trouble to report the matter to our press. Our river, a pure fresh water stream as it enters the city, is made a catch basin or dumping ground for all manner of filth, and a pure stream is thus contaminated and gives off dangerous and offensive vapors and gases as it passes the residences of the people on its way through the entire length of the city. Now how does it come to pass, that not only our press but the people themselves have been so long silent on this great cause of complaint. We trust that in the hereafter if any one in this city keeps a large number of swine, wallowing and steaming in filth under the heat of the midsummer sun, a very noxious and most offensive nuisance, endangering the lives and comfort of a large number of our people, our press will continue to sound the alarm until the cause of danger is removed.

We trust, that if in the future any of our butchers so far forget themselves as to endanger the lives of their neighbors by converting the rear portion of their markets into a slaughter house for dressing calves, sheep, poultry, etc., and then sweep the blood into the alley to decompose, and box up the trimmings, feathers, refuse, etc., and leave them in the alley to go through the process of decomposition, ferment and throw off dangerous and offensive gases and vapors, so nauseating and offensive in hot weather and so productive of nausea, fever and general indisposition; that this class of irregularities will be promptly made known to the proper authorities by a courageous and honest public press.

It is not an uncommon thing to see large heaps of excreta and refuse matter lying in our alleys, and about the rear of some of the buildings in our city. Now during the months of July and August such masses of matter are left to heat, ferment and throw off vapors, gases and odors, that are very offensive and dangerous. One such nuisance will suffice to make a whole neighborhood uncomfortable and unhappy. We trust that this class of irregularities will receive proper notice by our efficient public press.

The public press should be an educator in the highest and best sense of that term. It might perform a high and valued function by advocating the necessity of a proper understanding of sanitary regulations and the dangerous and fatal consequences of a neglect of the laws of health. It should always aim to elevate the morals of the young and encourage pure living and thinking. Therefore the editor should never permit the publication in the columns of his paper of articles of questionable propriety or demoralizing tendency. In this way the press may be a great public benefactor—may improve the public morals and habits of the people, may elevate and improve physical and mental conditions generally. The publisher may sometimes fear if he calls the attention of the people to some public

nuisance, that the man who created the same may stop the paper. But we have no fear in taking the position, that public opinion will always sustain and support a courageous public press in the honest and faithful discharge of a public duty.

The condition of affairs in this city for the last few years, from a sanitary standpoint, has not been quite all that could be desired, and for this sad condition of affairs the people themselves are largely responsible. Now, if the people respond to the call of duty in this matter of public improvement with the same spirit and activity that they have to like matters in the past, I think we may safely rely on the hearty co-operation of the Lapeer public press.

Note the languid step, sallow appearance and gloom of a people in a town with bad drainage, bad sewerage, bad water, and I was about to say bad sanitary regulations, but let me make a correction to correspond with the fact and say no sanitary regulations at all. Who wants to live in such a town as that? Is it strange that Lapeer city has been so long at a standstill, so far as growth is concerned?

Then contrast the lively step, pleasant appearance, the healthy and happy condition of a people in a town with good drainage, good sewerage, good water, an active, clean public press and an efficient board of health carrying out a perfect and complete system of sanitary regulations. Why, people like to live in a town like that. They come and they come to stay.

Diseases here have made such sudden and aggravating attacks, and often with such fatal results, that it seems to me about time the people bestirred themselves. The noble hearted, self-sacrificing physicians of Lapeer have had a hard life of it, rallied at all hours of the night from their broken slumbers and called in to aid if possible some poor brother or sister struggling with the grim monster. Is it strange that our good brothers the doctors have a care-worn look, and that they frequently find it necessary to go abroad temporarily for their own health?

The doctor and the lawyer have been co-workers for the common good of humanity from the days of the great law-giver, Moses, down to the present time. And it affords an espicial pleasure to me to be able to assist in a very slight degree these skilled doctors in this great work of charity and philanthropy. I hope and trust that these proceedings will terminate in the organization of a board of health authorized to act under some law or ordinance that will protect them in the discharge of their duty and enable them to make their work a success.

The note of warning has been repeatedly sounded in our midst. Some people, our best neighbors and citizens, young men and women in the very prime and vigor of life, have been swept into the hereafter with remarkable dispatch. Now I think this ought not to be so. And I believe it is not the natural order—men and women ought to live happy to a good, prime old age, and will so live under the proper sanitary conditions. How can any man be happy and prosper when his neighbors are unhappy? Now let us have better sanitary conditions and regulations so that we may live out our allotted time in health and happiness with our neighbors.

DISCUSSION.

The discussion of this subject was led by Dr. Hamilton, but his discussion has not been received for publication.

Judge J. B. Moore of Lapeer: I think I can hardly add to the interest of the subject matter of these papers by anything that I may be able to say. I was somewhat amused at the description Mr. Lynch gave of the self-sacrificing and care-worn appearance of doctors like our friends McColl and Burdick who look like the least care-worn men in the audience, and I have no doubt that members of my profession would be very glad to have some of the same care which seems to have such good effect with them. However, I am perfectly aware of the self-sacrifice these gentlemen are ready to engage in, for I think it may be truly said of the doctors that no man has been without their services because he was poor, and that they have been untiring in their efforts day and night.

I think the public press of this city at least is interested in the public health. If you look over the columns of the local papers, ever since the question of holding a sanitary convention was moved in this city, I think you will find that there has not been an issue where there have not been from one to a dozen paragraphs devoted to this convention, urging the people to take an interest in it and to take part in the discussion so far as they were able. It is true the public press has opened its columns to these patent medicine advertisements. I suppose it will do that just as long as people are ready to buy these nostrums, and I suppose the people will be ready to buy them as long as they are ignorant of the laws of health. That probably will be a very long time indeed. When a person is ill he desires a remedy, and if he does not improve as well as he thinks he ought under the doctor's care, he is then ready to take to these advertisements.

Henry B. Baker, M. D., Secretary State Board of Health, Lansing: I would like to know if one or both of the editors of the papers are present. If we were to hear from the members of the press themselves, perhaps we might get some idea of the duties of the people as well as the duties of the press.

It seems to me that what Dr. Hamilton says ought to teach us that the best way to get sanitary necessities started fairly, would be to have the people do what is necessary, as faithfully as the patent medicine men do. They do it by means of money. Now if it is for the interest of the people to have this information spread among them, as we believe it is, is it not for the interest of the people that the local board of health, representing the people, shall put money into it, and do as Dr. Hamilton has suggested, engage a certain space in the paper and pay for it, and see that it is filled each week? It seems to me that that is practicable and it is a question that ought to be discussed and acted upon: the utilizing of a certain portion of the paper, and paying for it. We have heard about the duties of the press to the people. It seems to me that the people themselves have a duty to perform. The city council represents the people, and if it is for the interest of the people to use the money in this way, and the people give the council to understand that they want it done, they would certainly do it.

— —: I heartily agree with all that has been said in regard to the duties of the press and the health officer, and this is the impression that I would have: The people must be educated. The people buy these worthless drugs that we hear of simply because they believe them to be useful for them, when they are not. Now to remedy that, we want the best talent, the best edu-

cated medical talent; we want a doctor to come to our homes when we are sick, and we want that doctor to take an interest in the case; and if it is critical we want him to be most skillful in his profession, giving nothing that will do an injury.

You take a person with consumption and all the time feeling bad, and he feels it necessary to keep taking something and he takes the very best thing he knows of. He takes up a newspaper and finds a cure for this, and every way is presented to get him to buy that and use it, we have every few days people coming here to our State, advertising different things and that they will cure this and cure the other, and people buy them largely, and when they go away and these medicines are used up, why, they are just as ready to buy of the next man that comes along. As long as the people do this and as long as the people are ignorant of their diseases and of the character of their diseases, just so long will they be imposed upon, but the time must come when medical science will be elevated and treated like other sciences, when quacks will be put down and the people educated.

Prof. Delos Fall, member of the State Board of Health, Albion: In reading a newspaper let the people learn to discriminate between that which is an advertisement and that which is legitimate matter in the paper, and we can do it very quickly if we only pay a little attention. For example: Dr. Hartman's articles in the papers stand next to the advertising columns. There is always a difference in type that will catch the eye by which the reader will see at once that it is an advertisement, and turn from that to legitimate reading. Let us learn then how to descriminate between the reading matter and the quack advertising in the newspapers. Let us learn to ignore that, and patronize the large hearted and sacrificing medical men who are in our midst and who aught to be patronized because they are our own citizens and take an interest in us.

Hon. R. L. Taylor, Lapeer: Perhaps it is not always on account of advertisements that men buy patent medicines. I think there is in men generally a sort of a feeling that they would like to take a chance. They come to the conclusion that they will not get any good from the doctor. They take a patent medicine and live for many years. Of course they will lay it to the patent medicine. Patent medicines are not to be relied upon. The laws of health must be attended to.

Prof. Delos Fall: (A question being asked concerning the use of narcotics.) Let me just tell you in a word of an experiment we made at the laboratory in extracting the poisonous principle from a five cent cigar,—the nicotine. We carefully extracted the nicotine from the cigar by the proper method of obtaining that poison, took a portion of it, a few drops, and gave it to a strong, vigorous and healthy cat. The cat went into convulsions instantly, and suffered terribly, so much so, and our sympathies were so wrought upon that we did not continue the experiment long enough to see how long it would be before it actually died and so put it out of its misery, but we were all convinced that the cat would not have lived many minutes under the action of the poisonous principle of a single five cent cigar. Then the question comes, why is not the man poisoned who smokes a stronger than a five cent cigar every day. I think his life is saved because of the fact that these poisonous principles are, a great many of them at least, vaporizable at a low temperature, and I cannot explain it in any better way than to say that the nicotine of the cigar, in being vaporized, and escaping from the cigar, does not pass through the man's body. I am satisfied

that there is poison enough in a single cigar to kill a man if it only had its proper condition to act upon the body.

This is true of cheese. We had such a case as this in our family where we partook of some cheese bought at a grocery, making part of the family sick, with all the symptoms of poisoning. I took the cheese to the laboratory, found the poison, and reproduced the symptons by taking a little of it, convincing myself in that particular way that it was the real poison. Then came the question where the rest of the cheese was. I went to the grocer, and found that my piece had been taken off next to the last piece and I took pains to find out where the last piece went to. The grocer took it to his own home. They ate heartily of it. Then came the question, why were not his family poisoned by this cheese. I inquired a little more closely about it, and I found it was their habit to toast the cheese before eating it, so they had undoubtedly driven off the poisonous ptomaine before they ate it. So the poisonous nicotine is vaporized from the cigar and goes off into the air.

Dr. Ira E. Parker of Dryden then read a paper on "Sanitation in small villages" which has not been received for publication.

THE AIR WE BREATHE, AND ITS RELATIONS TO HUMAN LIFE AND HEALTH.

BY J. S. CAULKINS, M. D., THORNVILLE.

However it may be in other worlds, on this planet which we inhabit the continuance of life is strictly conditioned upon the co-existence of three things:

Air to breathe;

Water to drink; and

Food to eat.

It is the fashion for the human race to wear clothes, live in houses, and cook their victuals, but life and its continuance is not conditioned on these three things; it can go on without them; they are the conditions of civilization.

The air we breathe in its relations to human life and health is the topic assigned to me tonight. We live in the ocean of air that envelopes our globe as the fishes live in their ocean of water; it is our element as water is theirs. Whatever living thing has lungs must have its regular supply of fresh air. Its privation means sudden death; its vitiation or insufficiency, presents discomfort and subsequent disease. From the penalties that follow the violation of this stringent law the human race is not in the least degree exempt. There is no favoritism in nature. If her laws are violated she will smother the noblest men and the lovliest women as ruthlessly as she would a litter of blind kittens. There was a time long ago when learning was scarce, when convicted criminals were pardoned if they could read and write. This was called giving them the "benefit of clergy." In the courts of nature no "benefit of clergy" is given, but instead, the opposite rule prevails: the higher the organization of the offender, the severer and surer is the punishment that follows.

There is nothing that will pay us better than making ourselves acquainted with the constitution and properties of the aerial ocean in which we live and flounder about, since we use it every minute of our lives and are dependent on it for life. The conclusion that will force itself on our

minds after making the most intimate possible acquaintance with our atmosphere, will be, that it is in every respect perfectly adapted to the needs of the inhabitants of the world it surrounds, if they would learn how to use it rightly.

Our atmosphere is composed of a mixture of seven gases, each one of which seems to be absolutely necessary to its complete constitution and the continuance of life on that part of the earth's surface not covered by water. These gases are oxygen, nitrogen, water in the state of vapor, carbonic acid, nitric acid, ammonia, and ozone.

The proportion in which these seven gases exist in the atmosphere differs widely, the first two making about 97 per cent of its entire bulk, in the ratio of oxygen to nitrogen of one to four. Although the others are relatively in minute quantity we must avoid the mistake of thinking them of less actual importance than the oxygen and nitrogen. A slight study of the work each has to do, will show that no one can be spared from the gaseous envelope of our globe. We will make this brief study of the gases of the atmosphere beginning with

OXYGEN.

This gas is the supporter of combustion and (which is the same thing) of respiration in man and other animals. Without it there could be no fire on the earth and no life as we know it. The proportion which it holds to the rest of the air, about one fourth part of the total volume, is just right. If it were diminished fires would not burn well and the earth would be a cold place to live in; the temperature of the blood would be reduced; physiological and anatomical changes would follow, assimilating us toward lower types of animals, which would be fatal to intellect; and finally man if he survived at all would sink into a rude barbarism incapable of progress.

If the proportion of oxygen were increased combustion would be too rapid; spontaneous fires would break out and everything that would burn would be reduced to ashes, leaving charred and blackened ruins behind; cities would be impossible; and beset by perils, we should live a short and feverish life—too short to accomplish anything.

NITROGEN.

This gas, the bulk of which is four times that of oxygen, dilutes it to the right condition for breathing and making combustion safe. Unmixed with oxygen, fire would not burn in it, nor could the lungs of animals breath it: to try to do so would be as sure death as to try to breath water. Besides its function as the diluent of oxygen, it helps to form the nitric acid and ammonia.

WATERY VAPOR

which is the essential constituent of the air next in bulk to the preceding, unlike them, varies in quantity at times and places, from three to less than one per cent of the total. Although relatively in small bulk it is not the less necessary to the present condition of things than the previously named gases. If water did not have the property of drying up and rising into the air in vapor, there could be no clouds, dews or rains, and consequently no life, vegetable or animal, except in the water; the continents would still be deserts of solid rock, for watery vapor condensed into falling rain is the

agent that has changed them from their original condition and fitted them to be the home of man. Without watery vapor in the atmosphere, fishes would be the only possible inhabitants of the earth.

The next essential constituent of the atmosphere which we are to study is

CARBONIC ACID.

This gas is in relatively very small quantity compared with the others; it forms about 1–4000 of the total bulk of the atmosphere. It differs from the gases already studied by having a perceptible smell and taste and in being considerably heavier. It is called by some writers a poisonous gas, but its qualities are only negative; it does not seem to be actively poisonous. Fire will not burn in it and animals will drown in it as quickly as in water; it kills by shutting off the supply of oxygen. Carbonic acid is a compound gas, formed by the union of oxygen with carbonaceous matters: wood, coal, oil and other things we use for fuel to produce light and heat; and breadstuffs, potatoes, oils and fats which we consume for food are carbonaceous matters.

The union of oxygen and carbon always produces heat more or less, according to the intensity of the action, and is the main source of artificial heat, including animal heat, which is produced by the slow combustion in the lungs of the carbon in our daily food. Carbonic acid is formed (and goes into the air) every day in immense quantities by the fires and lamps everywhere burning, and the lungs of men and animals everywhere breathing. Why is it that it does not accumulate every year until its amount would make the air unfit to breathe? The reason lies in one of the adaptations that make life possible on this earth. Carbonic acid, which is the refuse of the animal kingdom, is the main food of the vegetable. Every leaf of every tree, bush, grass or weed, is furnished with thousands of little pores or mouths which greedily suck it up for the use of the plant which, by the aid of sunlight, turns it to wood. This is the reason that the enormous quantity of this acid that escapes into the air every day has not long ago exterminated animal life from the earth.

Carbonic acid cannot be breathed without injury, in more than its normal quantities in the air.

NITRIC ACID AND AMMONIA

are two substances that are constantly formed in the air and as constantly washed down by the rain and absorbed by the earth. They are essential constituents of the air and are made of the gases by electrical action: nitric acid from oxygen and nitrogen, and ammonia from nitrogen and watery vapor; ammonia is also formed in and escapes into the air from the decay of animal and vegetable substances. The amount of these gases in the air at one time is not so great as that of carbonic acid, but it is no less necessary to the growth of the vegetable kingdom. Without them plants could never mature a seed to perpetuate their race.

OZONE,

the last essential constituent of the air to be considered is the smallest of all in amount, so small it cannot be collected in appreciable quantity. Tests for it show that it varies at times and places and is sometimes absent. It

is oxygen in another state, and its office is to destroy noxious substances in the air like the seeds of diseases, and in destroying them it is used up; this is why it is generally the case that it cannot be detected in our houses or over swamps and marshes. Ozone is the scavenger of the atmosphere. It is the product of electrical action. It destroys all hurtful emanations of decay and disease which are constantly escaping into the air, and which would else accumulate from year to year and make it too pestilential to support life.

This brief inquiry into the constitution of the air we breathe shows that the prefatory remark is true, that it is perfectly fitted to the needs of the inhabitants of our world. It is not apparent that any improvement in it could be made. In its native purity as it exists out of doors, away from swamps and marshes and the habitations and workshops of men, it is the food and support of life—the pabulum of animated nature. The inference is plain that contamination of the air by anything not belonging to it is hurtful. The precept and admonition which nature gives us is, "preserve the purity of the air in your dwellings, workshops and public buildings." To obey this precept we must arrange for a supply of fresh air to take the place of that we have breathed, and that which has been exhausted by lamps and coal stoves; wood stoves are less hurtful, the carbonic acid formed mostly going up the chimney.

The main source of danger is the expired air. We breathe 16 times a minute about 20 cubic inches of air at a breath. If we could use the air all up, that would be about a cubic foot in five minutes, but we cannot do that, the truth being that the expired air brings with it from the lungs an unnamed poison so powerful that a few breaths make a cubic foot unfit to breathe again. It is this poison that gives the disgusting smell to a tightly closed bedroom in which several people have slept and makes us glad to get the fresh air of the morning.*

It is no exaggeration to say that in a room 16 feet square and 10 feet high inhabited by five persons the air must be changed five times every hour. This means an outflow of 200 cubic feet of exhausted air a minute, and an inflow of the same amount of fresh air to take its place. This can be easily done in mild weather anywhere, but in cold weather in over crowded tenements of the very poor it is a difficult problem. What is the best working rule to go by to meet the difficulty? It seems to be this: bring the fresh air from out doors through a pipe that shall connect with a tube passing through the stove and discharging the hot air at the top. This being lighter than the cooler air of the room, rises to the ceiling and makes there a stratum of warm air, the level of which will constantly settle nearer to the floor. If the room is not over crowded there may be no need of any exit for the exhausted air other than the crannies around the doors and windows, but one should be provided at the level of the floor, opening into the flue of the chimney that carries off the waste gases of the stove to be used if needed. The chimney, instead of merely coming through the ceiling of the room, must begin at the ground. The draft caused by the current of hot air going into the chimney from the stovepipe, will give suction enough at the opening at the base to carry off the used up air without

* What the want of fresh air to breathe will do is shown by the history of the Black Hole of Calcutta. The British fort at that place was captured by the Barbarian Surajah Dowlah and the whole garrison crowded by him into a room 20 ft. square with only two windows. The struggle and crush for air began immediately, and only a few of the strongest that could keep their position near the window were alive the next morning, 126 having died during the night.

injury to the draft of the stove. These remarks apply to the ventilation of the dwellings of the poorer classes where one stove is often used both in cooking and heating. There is an economy in it that is of considerable importance where fuel is dear, all the heat that the air takes up in passing through the stove being a clear saving out of that which the stove could not radiate and would otherwise go up the stovepipe.*

This plan will adequately ventilate the living rooms of dwellings as well as schoolhouses, offices and other rooms used only by day, but the sleeping rooms generally small and over crowded at night, there is where the trouble begins.

How shall we get fresh air enough into the bedrooms to insure the health of the sleepers? This is a problem not yet thoroughly worked out, in all respects, at least for the coldest weather. In mild weather air can be let in from out of doors, but when it is severe, and bedding is scarce, that cannot be done so well. We must then depend mainly on the respiration of the walls and ceilings—that is to say on the passage of the air through them, which in very cold weather will go on rapidly through a plastered wall. But we must avoid the pernicious practice of papering them. That stops the exchange. To paper a bedroom, especially its ceiling, is a thing of which the sanitarian cannot approve.

Cities are liable to a danger of contamination to the air to which unsewered places are not; this is the return into the houses through the pipes, of the air from the sewers. It is unpleasant to smell, but I believe city people get used to it till they do not mind it much. I once attended a sanitary convention in another town, and naturally went to the hotel where some members of the State Board of Health were stopping. The smell of sewer gas about the house was too much for me and I looked for other quarters, but the rest did not apparently find it so bad that they needed to change. What the remedy for the mischief and discomfort caused by sewer gas is, I am not well enough posted on the matter to say, but it looks as if it would be a partial return to the old slop pail system, with the sewer pipes in an annex. There is another agent of contamination to the air in our dwellings that must be spoken of before closing, that is the cellar of the house. The decay of vegetables in it is not meant. Everybody knows better than to tolerate that. The danger alluded to comes from the draught from the cellar. There is air, everywhere in the ground and the cellars suck it out. It is not generally good air to breathe, being liable to be charged with carbonic acid and germs of diseases and the organic poisons that accumulate around a house that has been lived in long. A cellar should not be built under a house if it can be avoided. If it must be there let the floor and walls be made air tight which can be easily done with building paper and cement.

SUMMARY.

1. Air is the first want of life.
2. In its native outdoor purity the atmosphere is perfectly adapted to our needs.
3. We must keep the air in a pure state in our houses if we would be well.
4. There are causes in dwellings that constantly tend to make the air impure.

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*The practical objection to this plan at present is that tubular stoves to burn wood in are not yet made. Coal and natural gas stoves of this sort for heating only, can be had. The application of the plan to stoves for all kinds to fuel will soon follow.

5. These causes are mainly two; the breathing of the inhabitants of the dwelling and fires and lights used in it. Of the two main causes that vitiate the air respiration is the worst.

6. A perfect system of ventilation requires a constant supply of fresh air equal to that vitiated by these two causes.

7. In warm weather good ventilation can be had by keeping doors and windows open.

8. In weather too cold to do this the fresh air should be brought from out side in a pipe under, and coming up through the floor, to connect with a tube passing through the stove (or with a "jacket" around the stove), and discharging the hot air at the top. The exit pipe or flue for foul air should equal in size that for the inlet for fresh air, and the entrance to it should be at the floor level. In buildings heated by hot-air furnaces, the same principles are employed, both for fresh-air inlets and foul-air outlets.

We will close by saying that if this paper of mine seems rather long you must remember that breathing is our main business in this world and takes all our time.

DISCUSSION OF THE SUBJECT OF VENTILATION.

The discussion of this subject was led by E. O. Jones of Lapeer, who was followed by Hon. B. L. Taylor. Henry B. Baker, M. D., being called upon, spoke substantially as follows:

Remarks by Henry B. Baker, M. D., Secretary, State Board of Health.

(Reporter's Abstract.)

This is a very important subject, and I wish I could put before you what seems to me to be the best method of ventilation, but I fear I would take too much time.

It seems to me that a great many truths have been uttered by the speakers who preceded me. One of the important things in life is to keep warm, as Mr. Jones told us; and we cannot have ventilation without heat. Heat moves the air. It is by the difference in weight between the outside and the inside air. We cannot have ventilation, as Mr. Jones says, unless we have the warmth.

Secondly, we do not need artificial ventilation except in the winter time. In the summer time we can admit all the air we want through open windows, etc., without any suffering. The proper question is: How can we get the fresh air in, in the winter time, and still keep warm? Now it seems to me there is only one way to accomplish that, and usually it is not accomplished. They usually open the top of the window or place little holes in the chimneys high up in the room. In summer time that is all right, but when we most want ventilation that is the wrong place to get it. The proper way is to bring the air from out of doors to the heated surface, and let that warmed air come into the room, and save it when we have it in. When we get air into the room, we want it warm and we want to keep it there until we utilize it. To do this we must close the upper portion of the room, and we cannot afford to take the air out at a point higher than the floor level.

Now I shall disagree with Dr. Billings on the point that the fire-place is the best ventilator. We should take out the air nearer the floor level. In this way we can keep our feet warm and our heads cool, we can soon get the temperature at the head level and at floor level about the same. You can then keep in a comfortable condition.

There is one important point I wish to speak of and that is the contamination of the air after it gets in. That occurs from three sources. By the the breath, fire and lights, as mentioned by Dr. Caulkins, and I shall mention another one: The disease which causes most deaths in this city and throughout the world is consumption. About every eighth person (take the audience through), probably has consumption in some form. Spitting on the floor leaves the seeds of that disease, and every room of this sort in the State is likely to have the germs in it. Now what do we do when we come into a room like this? We inhale those germs. Look up on the walls and see what has settled on the plaster there. That dust has been carried up from the floor by heat, and settled in great quantities there. Foul air, containing the germs of diseases, should be removed, and fresh air should be taken in from out of doors. We should not warm, over and over, air which has been breathed through the bodies of the people over and over again.

I should prefer putting a jacket around the stove, and thus warming the fresh air, rather than having the small tubes through the stove to which reference has been made.

Prof. Delos Fall, member of the State Board of Health: (In response to a question in regard to the chemical composition of the air after being heated in the jacket around the stove.) We must not confound this body of air in the room which is diminished—consumed by the stove, with that air which is brought in from out of doors. Bringing the air into a furnace that is situated in the cellar or into a jacket around the stove and heating it, leaves that air in exactly the same condition chemically as it was before. But it is better air. It is nearer bodily temperature. It is fit for respiration and we don't get the evil effects of cold air taken into the system—we don't catch cold.

As fast as we use the air more air must come in. The evil effect of highly heating the air is a serious one, but the evil is in the heating of the furnace or the burning out of the furnace. If we use a small pipe to let in the air, after a time the fire box is red hot, and in a year or two it will have to be replaced by another one. The evil is to the furnace and not to the air.

There are three things we cannot have at the same time: Proper heating, proper ventilation and low cost. You may heat a room at little cost. You may shut every cranny and every crevice so the air will stay warm, and keep warm a long time. You can heat the room with little cost. You can ventilate a room very cheaply by opening windows. That is a cheap way of ventilating but, if you ventilate that way, you don't have your heat. You cannot have your heat and ventilation both without cost.

Dr. J. S. Caulkins: (In response to a question.) Stated that he did not object to a cellar properly secured from the entrance of contaminated air from the earth around the building.

THE WATER SUPPLY OF LAPEER.

BY H. MC COLL, M. D., OF LAPEER.

(Reporter's Abstract.)

One of the most important things in the world is water. It is the most generally diffused, is found in our bodies, and is necessary for both vegetable and animal life.

The water-supplies of different peoples at different times have differed considerably. The pioneer in the early history of this country would go to

the nearest stream, some pool or the nearest spring to get his supply of water. I remember very well how when a boy we used to dig a hole in a hollow place, sink a barrel into the water accumulated there and use that water. Many a time in taking the water out of the barrel I would strike and drive the wigglers down to the bottom so as to leave it clear at the top, and then I would find a few wigglers in the pail after all. We drank that water, used it for cooking purposes and otherwise.

That was not very pure water, and many of the pioneers suffered from malarial troubles and diseases peculiar to frontier life, but in that pioneer life there were perhaps few of those diseases which we call communicable. We had no typhoid fever, we had no scarlet fever, we had no diphtheria in those places. As the country became cleared up, the supply of this water became smaller. Sometimes it dried up with the clearing away of the timber. Those low places were drained and it was necessary to sink wells. We sank wells down sometimes to a great depth. I knew a well that was over 90 feet deep, and yet we got a very little supply of water there. It was pretty pure water and good water. It is being used still for a great many things, but while that may be all right for farming communities and may be all right in a pioneer life of people—the best perhaps they can do—yet in towns of this size, and in smaller towns as well, wells sunk in that way are apt to become very dangerous. In towns of this size privy vaults are dug close by the houses, wells are sunk not far from there, and in some of our squares you will find that scores of privy vaults have been covered over so that it is almost impossible to tell where they are and contamination easily makes its way from these privies to our wells. Germs of disease are carried into them, poisonous seeds are planted there, and these seeds are taken into the system. We drink the water and disease and death follow as a result, as long as we use those old wells we will have that danger impossible to be met with in towns of this size and that danger will increase every year so long a these wells are used. I don't think I saw a genuine case of typhoid fever in this city for a number of years after I came here. After a while, typhoid was reported, the wells became contaminated and almost every season since we have had cases of typhoid fever and these cases of typhoid fever have been traceable to drinking water in almost every instance.

I have drawn here a rough sketch to represent some of the dangers that arise from contamination of wells. This drawing represents a double house in which two families live. Here is a well 30 feet deep. Here is the barn. Back of it a privy. There is one privy not more than 30 feet from the well, which is 30 feet deep. Here is another privy vault and there is another. Here are three houses in front, another well here, another well there. In this house appeared cases of typhoid fever and several deaths took place. Last year typhoid fever again occurred in that house, and no doubt from the use of water from that well. The well was contaminated; the well was poisoned; the seeds of disease were there.

Here is a hotel on this square. Five or six privy vaults are on the square, and there is a large well not far from the privy vaults. This well has been used, but is not being used now, as they have a better supply of water. I have had several cases of typhoid fever which developed from drinking of water from the well.

Two miles north of this place there was a house in which typhoid fever occurred. The water there looked sparkling, but there was a privy vault not far from the well. The family moved out. Next season another fam-

ily moved in, and there were five cases of typhoid fever in that family. In an adjacent house there were five cases, and across the street there were ten cases, caused by using this water. They discontinued its use, the well was closed up, and there has not been a case of typhoid fever in either one of these houses since that time.

Now in our city we have a better supply of water in our wells. We sunk five artesian wells. From this source we get sufficient water for our city, and the water is good. It is somewhat hard, but it is good pure water. We had an analysis of the water made. In connection with this supply we have about eleven miles of pipe. We have something over 220 takers of the water at the present time, and I think that will be nearly doubled next year. This water comes from down deep in the rock, and we are as proud of our water-supply as anything else we have in the city of Lapeer, and I would urge upon everybody who has not a well sufficiently protected, to use that water so as to insure safety against the seeds of diseases, such as these that I have mentioned.

DISPOSAL OF WASTE AND EXCRETA IN LAPEER.

BY HON. J. B. MOORE, LAPEER.

(Reporter's Abstract.)

This topic is not a pleasant one—not one to afford the motive for a picture, but it is a very practical one, and no problem is more important to discuss than the getting rid of excreta. I only need refer to the cases cited before this convention, where typhoid fever has been traced to wells contaminated because of improper care in disposing of excreta.

We may regret that we have no more manufacturing enterprises, but it is the tendency for the great enterprises to go to the great cities, and the great cities will grow larger while the little towns must continue supplying local needs. Let these little towns supply pleasant and comfortable homes, for people can live more comfortably in such a place than in the great manufacturing centers. Now nothing is more necessary to the securing of healthful homes than the right disposal of excreta.

Much waste can be burned. Other refuse, such as oyster cans, etc., can be put in a pit in the ground. If slops are to be thrown upon the ground, they should be used as fertilizers rather than thrown in one place.

If we could have a system of sewers it would be the best way, but this would cost money, and until such a system is adopted we have a provision in nature for waste disposal. The dry-earth system is in use in many cities and the road dust found in our streets is in good condition to be thus used. Privies should be so arranged as to use dry earth and then at regular intervals they should be emptied. Go through parts of the city on a damp night in August and there is an odor in the very air which shows our present danger. These privies should be cleaned out and give way to the dry-earth closet. These closets should be cemented and a quart or so of earth or coal ashes should be immediately thrown on each dejection. In this way no one would suspect from the senses that anything objectionable was there.

What is true of the city is to a certain extent true of the country. If better precautions were taken many sources of danger might be headed off and lives might be saved.

DISCUSSION OF THE DISPOSAL OF WASTE AND EXCRETA.

BY PROF. DELOS FALL, MEMBER, STATE BOARD OF HEALTH, ALBION.

(Reporter's Abstract.)

It is true that this question is not a pleasant one but it is not the consideration of it which is unpleasant. It is the thing itself—the system perpetuated by our own acts. This system connects us with barbarous times. Let us see it in its true light and resolve to accept the suggestions made. As to the care of the dry-earth closet, coal ashes will do as well as earth and these coal ashes must be removed. There is no better way to remove them than by the closet. Personally, it takes me about three minutes each week to remove the refuse matter, and I spread the contents of the two pails on the garden with as little discomfort as though it were water. The true sanitary way is to have one person engaged by several families to do the work once a week or month.

You have a water system here, and an artesian well kept safe by constant surveillance, yet there are those who persist in putting down in their own yards three openings—one for a well, one for a privy and one for slops; and if we speak of their danger they ask: Is not the earth a good filter? Let us see. These germs of disease have been known to pass underground not simply 30 feet or 500 feet or 30 rods, but a mile. There is a lake under the city of Lapeer all the time and many of the vaults in Lapeer have been going on for sixty years. The result is that the earth is perfectly saturated, and that material is filtering by this great underground lake to your wells. You may say that you have been drinking the water thirty years and yet you are well. But if you could contrast your system with what they would have been, had you used purer water, you might see a marked contrast. Some of these pale faces might be attributed to it. But in your case the specific germ of some particular disease has not found its way to your well, yet you are on the verge of such a disease so long as the privy-vault system is in use.

The waste passing from the body of a person sick with a communicable disease should be disinfected so that the germs may be destroyed. The best ways of performing this disinfection are stated in the pamphlets distributed here by the State Board of Health.

Hugh McColl, M. D., expressed the hope that the sentiment awakened at the convention would lead to the establishment of the dry-closet system in Lapeer. The old privies should be cleaned out and no longer used.

In response to a question, Dr. McColl stated that though there was a natural resistance of the individual to disease germs this resistance was at any time likely to be disarranged.

FIFTH SESSION, FRIDAY MARCH 28, AT 7:30 P. M.

After a cornet solo by Prof. R. C. Shaw, the following paper was read:

SEWERAGE AND DRAINAGE OF LAPEER.

BY W. J. ROBINSON, M. D., LAPEER.

It is not necessary to occupy the attention of this convention with any discussion of plans which an engineer should adopt to sewer or drain this city. Enough has been written and published on the subject of sewerage and drainage in general, so that every person has an opportunity to inform himself of the great necessity of a thorough sewer system in every town; no town being too small not to need a good and efficient sewer system; and every city should begin to put down sewers early, (adopting a well-considered plan), and not be influenced into a disregard of public health because of the expense which may interfere with some other public improvement thought to be necessary.

Lapeer has been sadly neglected in the matter of sewerage, and stands sorely in need of a sewerage system, it being perhaps about on a par with most other cities of the same size or smaller. The common council has considered this life too short to bother with such necessities as sewers in advance of actual present requirements, and the result is that the cesspool has been allowed to form in almost every person's back yard, and, as I am considering more especially house drainage, allow me to say that except in a very few instances there is no way of disposing of waste material except by the natural filtration of the soil. Slops are thrown either upon the ground near the kitchen door or into cesspools to decompose and fill the atmosphere with filth, and by the natural drainage of the soil to contaminate the water of all shallow wells and thus form hot-beds of disease of every conceivable form.

In September, 1887, we had an outbreak of typhoid fever in Lapeer; some sixteen cases in all, and it was found that every case was caused by using water from a certain well, that was considered excellent water, but, as stated above, the slops had been carelessly thrown upon the ground near by and drained into the well; thus the water was polluted. Again, in October, 1888, in another part of the city there were several cases that were traceable to a similar cause, a cesspool having formed about twenty feet from the well.

We have an excellent supply of water in Lapeer, from our water works, and there is no reason why Lapeer should not be one of the healthiest cities in the State, but the fact is that a large portion of our population depends upon shallow wells for a water supply, and many consider the water fully as pure as that supplied by the water works, while in reality, the privy vault or cesspool is almost invariably near enough to contaminate the water by leaching through the soil.

What Lapeer needs is a properly constructed sewer system for the immediate removal of all sewage, and not until we have such a system will we be in any measure safe from any epidemic that may make its appearance in our midst.

DISCUSSION.

George Arbury led the discussion of this subject, who spoke of the expense of introducing a sewerage system in Lapeer—a small city covering so large a territory. In concluding he said: Let us, as has been suggested, take one thing at a time. Let us each one go home to night and go forth tomorrow better citizens because we have had a sanitary convention here, —better citizens because we know more about sanitary questions than we did. As Judge Moore suggested this afternoon, Lapeer perhaps may not ever be a large manufacturing center, but we can hope for a good, comfortable and beautiful resident town, and a good place for a home. "All things come to him who waits." Let us be good citizens. Let us join ourselves in hearty coöperation for the common weal, and the results pointed out by this convention will be speedily reached.

Dr. John S. Caulkins, in response to a question by Hon. Robert Taylor, stated that kitchen slops could not cause typhoid fever unless the germs of typhoid fever found their way into the slops.

Dr. Henry B. Baker, in connection with this subject, said: In the city of Adrian, in this State, there was a school, where they had a catch-basin for pouring the slops in and catching the water from a pump that supplied the school with water. Into that hopper were poured the slops from the building. There was a case of typhoid fever there, a boy had typhoid fever. Some of the slops from the house were thrown into that hopper and supposed to go by a drain a long distance from the premises. Very soon about 50 cases of typhoid fever occurred in the school, and these cases could be traced to the water from that well. Prof. Lyster went to Adrian, as a committee from the State Board of Health, and he found that the slops had been thrown into the hopper, but, instead of being carried away by the drain and doing no harm, at least a portion of them had leached into the the well. Here was an instance where forty-five or fifty cases of typhoid fever resulted from putting slops in the neighborhood of the well.

After a soprano solo by Miss Eva Hemingway, the following paper was read:

THE PREVENTION OF COMMUNICABLE DISEASES.

BY H. MC COLL, M. D., OF LAPEER.

To prevent disease is better than to cure such disease when it has taken hold of the individual, and in this work of prevention all can take a part, if they will. To cure disease was considered the only function of the physician in times gone by, but as correct scientific knowledge has advanced a great army of healers has arisen who have thrown energy and spirit not only into the healing of maladies, but into proper measures to prevent such diseases as are communicable and so preventable, and their researches and knowledge, the results of untold labor, are given to the public freely and all that they ask is that the community give a hearty support to the measures they have discovered and the means they have devised to save human life, asking no pay except the consciousness of having done their duty.

It is a lamentable fact however that people generally are not willing to conform to that which will tend to their greatest good, and that they look with suspicion, if not with incredulity, and sometimes treat with contempt the efforts that are made to control the spread of disease from person to

person. Thus one careless individual may be the cause of suffering to a score of others and of death to a number. I have many facts in my possession where diphtheria has been spread and carried into a number of families by the criminal carelessness and opposition of individuals, entailing suffering that could not be paid in gold, and deaths that no price could compensate.

Of the communicable diseases that prevail in Michigan in the order of their fatality are consumption, diphtheria, typhoid fever, scarlet fever, measles, whooping-cough and small-pox. Now all these diseases are known as germ diseases,—that is, they arise from a specific seed or germ, which in a suitable soil will always produce its own particular form of disease, and nothing else. Scarlet fever does not arise spontaneously; but grows from the germ of scarlet fever just as surely as wheat grows not from peas or oats, but from wheat. Small-pox always arises from small-pox seed and not from filth or a decree of Providence. Typhoid fever likewise springs from its proper seed. It may be true that we cannot always trace the first case of scarlet fever in a community, or of diphtheria, typhoid fever or any other communicable disease to its source of contagion, nor can we always trace in the ordinary physical world the growth of noxious plants to their seed source. I well remember the first so-called Canadian thistle I ever saw growing in the top of a decaying maple stump on my father's farm. It attracted my attention, and, calling my father's notice to it, he at once recognized the dangerous enemy in the beautiful pink blossom, and setting fire to the stump destroyed it root and branch, and for many years no other thistles of that variety were found on the old homestead. Now where did that thistle come from? Did it grow spontaneously? No one will believe that. The seed was probably brought from a great distance by a bird and dropped in that soil so well fitted to cause it to germinate and develop into a perfect plant, to reproduce itself till the pest would cover the whole country adjacent. But my father's match destroyed it, and, for the time, the country adjacent was free from danger. If all who saw this pest had acted in a similar manner much labor might have been saved.

The same is true of communicable diseases. If the seed falls in proper soil, i. e., in the soil or condition of system favorable to its growth and development it will grow and, if care is not taken, it will spread over whole communities.

We know how ready, in cases of small-pox, people are, in this community to stand aloof and have such cases isolated, yet small-pox produces in our State the smallest death-rate of any of the communicable diseases. The reason of this is that in vaccination we have a means of controlling and preventing this dread disease. Still a large number in every community are not vaccinated or only improperly so, and many of the young children will not be until such time as an outbreak takes place and a panic is started. With small-pox we know that complete isolation of the individual and perfect care with regard to contact of unvaccinated persons will prevent the spread of the disease. The same is true with regard to scarlet fever, diphtheria, measles, etc. In order to accomplish the greatest and best results the sick room of patients suffering from any of these diseases should have the smallest amount of furniture consistent with comfort. Carpets and all upholstered furniture should be removed. The room should be as far away from the living rooms as possible, and no one should enter the room except

the nurses, and they should not be brought into direct contact with the other members of the family especially if there are children.

All discharges from nose and throat in diphtheria and scarlet fever should be taken on cloths and burned, or received in strong disinfecting solutions in sputa cups. All discharges from the bowels and bladder should be disinfected carefully with chloride of lime or some of the other disinfectants recommended by the American Public Health Association, and which you will find described in the pamphlets distributed in the room. In typhoid fever the most frequent source of infection is through drinking water and the germ is conveyed to the bowels, or it may be inhaled in the air, find lodgment in the mucus of the fauces, thus be carried to the bowel and develop, producing its type. In all fevers of a direct typhoid type or simulating it, such as so-called bilious fevers, typho-malarial, etc., the utmost precautions should be taken to disinfect thoroughly the stools and urine, and to bury the stools at a long distance from any water-supply, for we do not know how long the spores of the germs found in typhoid stools may live or how deep they may be carried into the ground and thus find their way into wells and reproduce themselves in other human beings as well as other animals. People often say when questioned regarding drinking water: "Oh! it is all right; clear and sweet." Still it may contain poisonous seeds that will kill as certainly and sometimes more so than foul water. I remember sending two gallons of clear, sparkling water from a well a few years ago to a chemist to be analyzed, giving the reason that typhoid fever occurred in the house close to the well for two successive seasons and that another family using water from the same well also had typhoid fever,—five cases, while all on the opposite side of the road, using water from other sources, had no typhoid fever. The chemist reported: water, clear; no smell; on boiling containing nothing that would be detrimental to health. Yet I was morally sure (and am today) that though the chemist's crucible could not detect poison in the water, yet it contained, with all its sparkling qualities, the seed of the disease in those two families. The well was discarded and not a case of typhoid fever has occurred in either house since that time. Today, however, by microscopic examination and culture we would in all probability have found what we consider the seed of typhoid fever. Therefore use no water which may be the source of infection however remote.

About the duration of life of germs of contagious diseases some of those who discuss this subject will be able to give you information that will tend to deepen the impression on your minds.

All rooms in which the sick from contagious diseases have been nursed, should be thoroughly disinfected after their convalesence, and all clothes not valuable, destroyed, and the others thoroughly washed in disinfectants. Such as cannot be washed should be hung up in the room and fumigated when the room is disinfected. The easiest way to do this is by the fumes of sulphur but the way in which the fumes of sulphur are used is often of little value. For a room ten feet square and nine feet high three to four lbs. of sulphur should be used. The windows and doors should be made as tight as possible. Clothing to be disinfected should be hung up so that the fumes can reach all parts of the garments. The sulphur should then be set on fire and the room completely closed for 24 hours. Windows and doors should then be open for 24 hours, and in severe cases fumigation should be repeated.

Now, no community can expect to have proper supervision of contagious diseases without appointing somebody whose duty it is to look after such matters, and one who is paid for such work as well as for the ill will he may sometimes get for doing his duty. Our laws have made provision for such supervision by a health officer, but the niggardlyness with which the services of such officers have been rewarded in small towns and villages has made the service in some places one of very little efficiency, especially when taken together with the refusal of some men, calling themselves by the *holy* name of physicians, to report cases of contagious diseases and thus help arrest the hand of death.

I know from personal experience that the actual expenses of the office for stationery, printed material and vaccine virus were hung up in the council for some time although not one cent was paid or asked for services rendered. I also know that although the blank reports were supplied to all physicians some never reported a case of contagious disease, violating the plain letter of the law, as much as if they stole from their neighbor's house, and violating the law of human rights, as much as if they were accessories to murder. This year our common council has taken upon itself to act as the board of health and has violated the law by not appointing any health officer, so that we have no one who will look after the disinfection of houses in which contagious diseases may exist or help the physician enforce the isolation of the sick.

DISCUSSION OF THE RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

REMARKS BY HENRY B. BAKER, M. D.

I would like to suggest one reason why we do not make any faster progress in this important matter. It seems to me, while I have been listening to Dr. McColl, that possibly the common council of this city and the boards throughout the State, do not appreciate the work of the health officer because it is a different line of work from that with which they are acquainted. Usually when we employ a lawyer, or employ anyone to do work for us we have something we can see that they have done. Now if the health officer does his duty and does it with the most complete success, in one sense, there is not anything to show for it. There has been no epidemic. There is nothing left from which the common council can see what he has done. It seems to me that possibly this is the reason why we don't make any progress. We need to have an active imagination. It seems that we ought to make a scientific use of the imagination. We ought to be able to picture to ourselves an epidemic that has occurred somewhere else, where they have allowed the disease to spread as they recently did at Zanesville, Ohio. There is something to show for it there. If a health officer goes on and stops that epidemic probably they will pay him $500 for it. But if he had prevented the epidemic there would have been nothing to show for it. We need a health officer to stand guard,—to be on the watch-tower. We want to *pay* the health officer to be on guard and prevent there being any disease. He must stop the diseases as soon as they are brought in.

REMARKS BY A. ARNOLD CLARK.

I presume the people of Lapeer think that they have listened to more advice during the last two days than they ever heard during the same space of time, and you probably begin to wonder whether those who give this advice really follow it themselves, and if they do, how they ever find air which they are willing to breathe and water which they are willing to drink. It is always easy to give advice. "Subdue your appetites" said Mr. Squeers to his boys—"and you have conquered human nature", but his own mouth was full of roast beef when he said it.

Yet, I think you will agree that the advice to which you have listened at this convention has been much more practical than you expected. You had possibly looked upon the State Board of Health as a mere bureau for the collection of statistics, and some people can see no use in statistics. When Faraday was asked "What is the use of statistics?" he answered—"What is the use of babies?" In them are all the possibilities of future blessings.

For example when a health officer writes to the Office of the State Board of Health that in a recent outbreak of scarlet fever he had about twenty cases and three deaths and that he did not disinfect premises or isolate patients,—that is a statistic—if I may use the word in that form. When another writes that he did take these precautions and that the disease did not spread outside the family in which it first appeared,—that is a statistic. When hundreds of health officers make similar reports that is statistics. Still they are valueless unless something is done with them. We can't get any light from them,—they are all in the clouds, but when these facts are placed side by side and it is found that thousands of lives have been saved by those health officers who took these precautions in cases of scarlet fever and diphtheria,—that is the compilation of statistics—that is where the lightning flashes from the clouds.

When Cagny before the Congress for the study of tuberculosis in man and animals told the story of a young man affected with tuberculosis who tended a large number of chickens and who expectorated for the amusement of the chickens which rushed about greedily devouring his sputa, and which afterwards died of consumption, he simply gave an interesting piece of information. When Gautier caused guinea pigs to be breathed upon for two hours each day for six months by a man in the last stages of consumption and then showed that the guinea pig did not contract the disease from his breath, that was an interesting piece of statistics; but when these two experiments are taken together and in connection with scores of similar experiments it proves that without isolating those sick with consumption we yet can prevent thousands of deaths in this State by simply disinfecting the sputa of consumptives.

Some people see no use of laboratory experiments—they see no use in injecting under the skin of a cat's back a drop of water containing the germ of typhoid fever and producing typhoid symptoms in the cat, but when they understand that after this water is boiled to destroy the germs and then is injected it does not produce the disease, they see the practical value of the experiments.

You have learned at this convention the difference between prevention and cure. You have learned that it is more important to kill these germs before they commence trying to kill us. You have heard of the Irishman who swallowed a potato bug and then swallowed paris green to kill it.

You have come to the conclusion that it is better not only to spend five thousand dollars to cure you after the germs enter your bodies but also to pay at least a thousand dollars a year to an intelligent health officer to kill these germs before they commence trying to kill you.

You have learned that these diseases which cause the most deaths are diseases which we never ought to have. I would not go so far as Carlyle when he said that every sick man was a rascal, but I do believe there would not be any sickness from these communicable diseases if there were not some rascality or ignorance somewhere. It is ignorance—an honest ignorance,—after every one learns about it then it might become rascality. Huxley says the time is coming when a man meeting a friend on the street would as soon ask are you honest as are you well? when a man will be as ashamed to be told that he looks sick as to be told that he looks like a thief.

I am glad that this subject has been reserved to the last because I think that it is the most important of all. I appreciate the importance of the other topics, I am glad the attention was given last night to alcohol. I would not underestimate the evils of intemperance, and yet comparatively few really die from drunkenness, and there is often the feeling that the poor wrecked life is better in the grave. But over one-third of the deaths in this State are from diseases which we might prevent—diseases which deprive us of our loved ones in the innocence of childhood, the joy of motherhood, the vigor of manhood, when they are filled with happy hopeful dreams. Prevent these communicable diseases and death will come not as the poet sang, "like some untimely frost upon the sweetest flower in all the field," but in the autumn of life and with the gathered grain. I hope that these diseases will be prevented in Lapeer so that your citizens will all die, not of disease but of old age.

After an opera chorus (Auber) directed by Shad N. Vincent, the following resolutions, offered by Dr. G. W. Hathaway, were unanimously adopted:

WHEREAS, The people of Lapeer, by their presence here this evening as well as their attention at the several sessions of this convention have indicated the interest they have taken in the several topics which have been under discussion in the deliberations of this convention and the profit they have received therefrom and,

WHEREAS, they desire to give formal expression to their appreciation of the work of the convention, therefore be it

Resolved, That we, the citizens of Lapeer, tender the members of the State Board of Health our most hearty thanks for giving us this convention and for their able and wise counsel for our welfare.

Resolved, That we extend a vote of thanks to our visiting friends, to our worthy president and secretary, to the press, to those who have so kindly rendered assistance in furnishing music, and all who have so ably assisted in making these meetings so pleasant, profitable and successful.

5762.77

ASSOCIATION.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

BATTLE CREEK, MICHIGAN,

JUNE 25 AND 26, 1890.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF BATTLE CREEK.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1890.]

[No. 338.]

MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS.
1891.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

BATTLE CREEK, JUNE 25 AND 26, 1890.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH
FOR THE YEAR 1890.

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of this Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

BATTLE CREEK SANITARY CONVENTION.

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PROCEEDINGS,

ADDRESSES AND DISSCUSSIONS AT THE SANITARY CONVENTION HELD AT BATTLE CREEK, MICHIGAN.

JUNE 25 AND 26, 1890.

This convention was held under the auspices of the State Board of Health, arrangements having been made by a committee of citizens of Battle Creek, acting with a committe of the State Board of Health.

The following named persons constituted the local committee: A. H. Kimball, M. D., Chairman; S. S. French, M. D.; Hon. Charles Austin; Mr. T. B. Skinner; Hon. William T. Gage, and Rev. W. D. Simonds.

The Executive Committee consisted of Dr. S. S. French; Dr. J. H. Kellogg and Dr. Geo. W. Green.

Mr. T. B. Skinner and Hon. Charles Austin constituted the Committee on Music.

The committee from the State Board of Health consisted of Henry B. Baker, M. D., of Lansing.

The officers of the Convention were:

President—Judge Benjamin F. Graves;

Vice-Presidents—Hon. Edwin C. Nichols; Hon. A. R. Henry; Hon. Richmond Kingman; Hon. Charles T. Gorham, Marshall; Hon. William Mottram, M. D., Kalamazoo; Hon. A. O. Hyde, Marshall; Hon. Perry Mayo, Marshall Township; R. A. Martin, M. D., Albion; O. F. Seeley, M. D., Climax; Hon. Foster Pratt, M. D., Kalamazoo; A. W. Adams, M. D., Bellevue; Hon. J. Estabrook, Olivet.

Secretary—Geo. W. Green, M. D., Battle Creek.

Assistant Secretary—A. Arnold Clark, Lansing.

First Session—Wednesday, June 25, at 2:30 P. M.

The convention was called to order in the Opera House, by Hon. Benjamin F. Graves, president of the convention, after which Hon. John W. Bailey, mayor of Battle Creek, made an address of welcome, as follows:

ADDRESS OF WELCOME.

BY HON. JOHN W. BAILEY, MAYOR OF BATTLE CREEK.

Ladies and Gentlemen:

The pleasant duty that it now falls to me to perform seems so restricted and defined that I presume each of you now know full well what my

thoughts are, and can anticipate all that I could possibly say. You must have the same spirit of welcome which I shall now very poorly try to express.

You all know of this convention, you are personally acquainted with most of your people who are interested in it. You know very well by reputation the gentlemen who are here on the Board, to carry it forward. It is now my pleasure to welcome you to this and the future meetings of this convention; to ask you to come to all of the sessions, and to bring your friends and your neighbors in order that the citizens of Battle Creek and the surrounding country may get the benefit of the information that will be supplied by the gentlemen who are here,—gentlemen who have spent their time and their energy freely in order to help those of us who will come. We welcome you from abroad, and you, gentlemen, who are here taking part in this convention, and we extend to you the heartiest welcome of the citizens of Battle Creek. We welcome you to one of Michigan's brightest, pleasantest and most thriving cities. We welcome you to a city with many natural advantages, water power for domestic purposes and pleasure, a good, vigorous healthy climate, high and fertile land. We welcome you to a city that has close to it a beautiful sheet of water, Goguac Lake, to a city with good streets, a small showing for parks, street-railways, water-works, electric light, etc. We welcome you to a city that is justly proud of its schools and churches. We welcome you to a city that is proud of its men and women who, by their energy and enterprise and public spirit, have given Battle Creek a place far up in the roll of Michigan's bright and thriving cities.

Gentlemen, this appreciative audience expects very many things of you, and but one thing of me; it expects of you that you will enlighten them upon subjects of special importance which have been delegated to you. I have no misgivings as to the result of your efforts, and I wish you all manner of success. It expects of me that I stop now, and not use up any more of your valuable time, and give way to the gentlemen with whom I am glad and proud to be associated on this occasion. I will not disappoint you.

In the absence of Prof. Delos Fall, Dr. Henry F. Lyster was called upon to respond to the address of welcome, which he did substantially as follows:

RESPONSE AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

BY PROFESSOR HENRY F. LYSTER, M. D., MEMBER OF THE STATE BOARD OF HEALTH, DETROIT.

Mr. Chairman, Ladies and Gentlemen:

The suddenness of the request will of course grant my making but few remarks.

These sanitary conventions were instituted some years ago by the State Board of Health, and I think were the first sanitary conventions that had been instituted in this country by any State Board of Health; and the object was to come near the people, and have people take a personal interest in the work of public sanitation. We have been accustomed to meet

in different cities and towns in the State, and in different parts of the State, and communicate directly with the people and have the members of the several towns and villages where we have met, take part in the convention. It is not intended to have a convention where the speaking is to be done only on one side; it is not intended that a half-dozen persons are to get up here on the stage and make you speeches. It is expected that members of the community will prepare themselves and present papers on sanitary matters, looking towards the improvement of the public health in the several places where we meet, and that the community also shall be interested in the matter pertaining to the improvement of the health of the place, and especially in those permanent improvements which can be made in their own homes.

I think the work of this Board, with reference to sanitary conventions, has been such that there is no portion of their work that has been more satisfactory to themselves and to the community. There has been a furtherance of good health in the several communities where these meetings have been held, and the work has been such that communities where we have visited have, as a general thing, improved their sanitary conditions.

There are a great many places where these conventions have been held, and a great many subjects that always arise for discussion at them, for instance, the influence of the water-supply on the health of the community is one of the most important. If there has been any advancement in medicine in the last few years, it has been with reference to the influence of cleanliness, good clean water to drink, presentation to the community of a water of a quality that will not convey poison. Another subject of great interest and equal importance is the removal of waste. In the line of sanitary matters of late years, it has been found that a large amount of disease depends upon the retention in and about the house, and in and about the city limits, of material that has been used and wasted. Where there is fermentation, there we have a large amount of poison developing which influences the health of the people. This poison sometimes permeates the water-supply and a local epidemic will follow, such as typhoid fever, dysentery, sometimes malarial fever; and all from the miasm that is generated in it. And we have in the line of our work found that in the removal of waste material that has been used, and water from the community and from the homes, if it has a perfect exudation and if it is entirely removed, there have not followed a number of so-called miasmatic diseases represented by such diseases as typhoid fever. So that in the line of professional work today, and professional thought, the supply of pure water, and the complete removal of sewage matter from the community, are the most important. In the line of this work, will be the effort to perfect what is called the storage of effete matter, matter that has been used, the waste from the house and the slops from the kitchen and the waste from the community and to cause it to be entirely removed from the vicinity of the home. This is one of the most important subjects that will be brought to your attention at this convention. The prevention of any storage system like the barbarous method of retaining vaults and cesspools near the kitchen, will prevent a contamination of the water, which is one of the most important things to be considered as conducive to good health. It will be shown here that there is a certain movement in the air in the vicinity of the house, and in the winter time even when the upper surface of the earth is frozen to some three or four feet, that still underneath

that frozen part, there is a circulation of air which gets into the house, and that the gas coming from such sources is one of the great evils to be prevented.

I will not stop now to rehearse the subjects which will come before the convention for discussion. Suffice it to say, that these, and different subjects I have not alluded to, will be subjects to be discussed by those present at the convention.

PRESIDENT'S ADDRESS.

BY JUDGE BENJAMIN F. GRAVES.

Ladies and Gentlemen:

The very presence of this assembly is among the typical expressions of American civilization.

It owes its inception to that spirit of fraternity which can only obtain in fullness where the welfare of every one is closely associated with the welfare of all. And the method actually chosen of getting together in convention to discuss and decide is as preëminently American as Bunker Hill.

In other countries the initiative in such cases must be taken by government or by persons in rank or consequence; but in America the people never dream of waiting for such leadership. They charge themselves with the duty of originating and contriving beneficial movements and hold themselves responsible for their advancement. If government becomes a participant it is never as being a *sovereign* but rather as a servant or auxiliary. At every point of the compass persons of all ages and conditions, and dispositions, are constantly concerting and gathering in circles of some form or other of association. Some one starts a project, and forthwith the idea is taken up, that the subject is worthy of public attention.

The next step is a meeting to consult about the matter, and the agitation culminates in its primary stage, in the formation of a working association.

This process is so habitual with us that we are slow to realize that it has no place among the facilities of foreign societies, and generally forget to credit it as one of the chiefest of our domestic agencies in the career of improvement. The meeting of persons in disciplined and self-governing communities, to compare opinions, and contrast experiences, is only a practical step in the path of Bacon's philosophy. The promptings of this class of movements have their sources in the well spring of our better nature. There is no mixture of those selfish instincts which usually betray their influence in the stir of our every day affairs. Without the shadow of a thought to serve anything but humanity, the resolve is deliberately made to incur the lukewarmness or indifference, and may be the prejudice and displeasure of the many, and most largely indeed to forward and subserve their comfort and their happiness.

But we are not to forget in passing this encomium that the excellence of a cause is not always a sure criterion of the wisdom of all who profess to espouse it, and were it necessary it would not be difficult to cite eminent authority for the position, that professors of reform are under constant obligation to apply the best reformatory tests to their own judgments. There is always more or less occasion for taking security against self illusions. The habit of achievement in the realms of science or morals may sometimes induce dogmatic tendencies or create a bias for generalizing on

insufficient data. It may also happen that individuals happily imbued with the philosophic spirit are yet not quite exempt from a drift towards hobbies, and it is always well to be on the look-out for breakers of that sort. Very reverent attention may be accorded to all the contributions brought forward by such persons; but common sense can never excuse itself from giving a verdict on their testimony.

There are certain conditions which are practically unavoidable. Our lot has been cast under their subjection, and however we may bite our chains, we cannot break them. It is undoubtedly a provision of the Divine Economy that we use the faculties given us, to foster a better adjustment between ourselves and surrounding conditions. But surely a recognition of this duty cannot lessen our vigilance to avert serious mistakes.

We must have air and food and drink and be protected against cold and against heat, and as respects these, reform can go no further than to meet the particular want with the very enjoyment most fully adapted to it. Were a person to become so credulous as to seriously heed the divers conceits which bubble up in the sea of speculation, or seriously regard the crudities which are always swarming in the domain of crazy empiricism, it would be quite impossible to go on at all. Nothing would be left either to eat or to drink outside of the list of forbidden things. Neither would there be any air of sufficient purity and tone to be quite proper for anybody to breathe. In respect to all matters of this nature, as in respect to others, the responsibility is laid upon us to be reasonable and to try to grow wiser and better in the progress of things, and not more visionary and absurd.

The pioneers in this philanthropic work deserve every praise. But we are not to forget their relation to the community. The body of society has a peculiar claim on these specialist members. The order of Providence regards their genius and skill as a perennial fund to leaven and elevate the entire mass, and it is a pleasing reflection that whilst no draft upon this resource can lessen its affluence, it may on the contrary quicken the exuberant springs which feed it. One portion of the public grows better by teaching and the other by being taught.

We can roll back the curtain of the past and remark the progress that has been made; but we cannot forecast the future and map out the achievements which it has in store. The upheaval of the last half century fills us with amazement. Who can imagine the possibilities that lie hidden in the next? The accumulations of knowledge which build themselves up year by year as additions to our former stock, are also accumulations of *power* and *facility* to engender still more knowledge; and thus are the conditions of progress multiplied.

The horizon constantly flees before us, but it is our duty to march bravely on.

THE RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH.

Mr. President, Ladies and Gentlemen:—The title of my paper—"The Restriction and Prevention of the Dangerous Communicable Diseases,"—may lead some of you to ask: What are the communicable diseases most

dangerous in Michigan? and, How much danger is there in Michigan from those diseases? Correct answers to these questions will enable us to know whether it is worth while to take the trouble to learn just how to restrict or prevent them. But, before I answer these questions, I suppose you will all, or nearly all, admit that small-pox is a dangerous communicable disease, and that it is worth while for every intelligent person to know just how that loathsome disease may be avoided. Therefore, I wish first of all, to mention the best measures for the prevention and restriction of small-pox; and to express my belief, and the belief of the medical profession throughout the world, that, by means of vaccination, and re-vaccination once in about five years, small-pox may be almost entirely prevented. That would dispose of this part of my subject, if the people would all avail themselves of the protection of vaccination, accurate knowledge of which, an eminent British sanitarian has said "is beyond all comparison, the greatest practical good with which medical science has enriched us."* Unfortunately a large proportion of our people, through ignorance or carelessness, fail to accept this "greatest practical good with which medical science has enriched us," fail to *prevent* small-pox by vaccination; therefore it becomes necessary to know how to *restrict* small-pox.

For the *restriction* of small-pox it is essential:—

1. That the local health officer shall have notice of the occurrence of a case as promptly as possible. He should have notice about as promptly as the fire department has of the occurrence of a fire.
2. The health officer should promptly isolate all infected persons and things, and keep them isolated until freed from infection.
3. The local health officer should offer the prompt vaccination or re-vaccination of every person exposed to small-pox who has not been recently vaccinated, or who has not recently had the small-pox. No such person should fail to be vaccinated as promptly as possible.
4. The local health officer should have continued supervision of every case of small-pox until complete recovery or death.
5. After death or recovery of the patient, the local health officer should thoroughly disinfect all infected premises and things.

But is small-pox the most dangerous communicable disease in Michigan? It is not. If vaccination should be generally neglected, it might become so; but the experience in Michigan during the past twenty years proves that there are several communicable diseases which are far more dangerous in Michigan. Whooping-cough has, during the past fifteen years, caused many more deaths than small-pox has. Therefore, if it is worth while to know how to prevent small-pox, it is worth while to know that by prompt and complete isolation of cases, and thorough disinfection of premises, whooping-cough may be restricted. We do not yet know how to prevent it, except by keeping away from it and perhaps from articles exposed to it. Whenever the people generally agree that they will coöperate for the restriction of whooping-cough the health authorities of the State will undoubtedly coöperate, and scores, perhaps hundreds, of valuable lives will be saved in Michigan, in every year.

But, to return to the question—what are the greatest dangers to life in Michigan? Named in the order of their importance, the one that causes the most deaths first, the five diseases which cause most deaths in Michigan are: (1) consumption, (2) diphtheria, (3) pneumonia, (4) typhoid

* John Simon, Public Health Reports, Vol. 1, p. 282.

fever, and (5) scarlet fever. Pneumonia is probably a communicable disease, but we are not yet prepared to enter vigorously upon its restriction; but you will see that all of the most fatal and important diseases in Michigan are communicable diseases; all are, in some way, spread from person to person.

We thus gain some idea of the vast importance of this subject,—the restriction and prevention of the dangerous communicable diseases, which include all the most important causes of death in Michigan. I fear, however, that few people in Michigan really have any fair idea of how important this subject is. Let us examine it a moment. In the first place, we absolutely know that a large proportion of the cases and deaths from the most of these diseases are *preventable*, and we believe that this is true of all of these diseases. Then as regards the most dangerous one—consumption, we know that about one-eighth of all the deaths in Michigan are from that one disease. Think of a spreading disease from which one-eighth of all persons in Michigan and of persons who have reached the ages of those of us now in this room, considerably more than one-eighth are liable to die, and this disease may be, as I believe, in great part prevented!

COÖPERATION NECESSARY FOR THE RESTRICTION OF DISEASES.

For the prevention of consumption, however, it is necessary that all the people shall coöperate. No one can fully protect himself so long as others do not understand the subject and act accordingly. Therefore, the only way this most important cause of death can be most completely avoided by any of us, is by increasing the proportion of the people who know how to restrict and prevent consumption. If we except small-pox, which may, by vaccination, be avoided by each person for himself, a statement similar to that just made relative to consumption would be true relative to each of the dangerous communicable diseases; for the restriction of each there is required general diffusion of knowledge, and general coöperation of all classes of people. That is a good reason why "the restriction and prevention of the dangerous diseases" is given so prominent a place on the program of every sanitary convention.

HOW THESE DISEASES ARE SPREAD.

But these diseases are not all spread in the same way; and it is necessary that the people generally shall know how each one is spread, in order to know how to restrict each disease. In each disease something goes from a sick person which is capable of causing the disease. It goes from that part of the body in which the disease is located, and generally it thrives best when it reaches that same part of the body to which it goes. In consumption that part is generally the lungs; and the specific cause of consumption goes out with the sputa, and is scattered about not only wherever the moist sputa goes, but also wherever the dust from the dried sputa goes. And, as the dust of the air is breathed in with the air inhaled, there is opportunity for the specific cause of consumption to go at once to the part of the body in which it is usually found.

This indicates what is the most important measure for the restriction of consumption,—namely, the *destruction or disinfection of all sputa from every consumptive person.* This is something in which we all have a vital interest. Until this is done the life of every man, woman and child is endangered to an extent which, as I have shown by the mortality statistics,

is greater than from any other cause whatever. The prevention of this disease would be the prevention of about one-eighth of all the present mortality; and the greatest proportions of the deaths are among adult persons.

These facts tend to make us impatient to learn what we can do to avoid consumption while we are waiting for the people generally, and especially for all consumptives to learn the importance of disinfecting all sputa from consumptives.

Before passing to those other branches of the subject, however, I wish to suggest *the importance of disinfecting all sputa, because consumption is not the only disease spread by it;* it is even possible that more sickness is caused by other germs in the sputa than by the one which causes consumption. We have just been through a great epidemic (influenza) that has caused an immense amount of sickness and vast numbers of deaths throughout a large part of the world, and there is reason to believe that important factors in the causation of all that sickness and mortality were certain micro-organisms which are generally present in the mouths of a considerable proportion of the people. The coming ideal man will disinfect all such sputa. Certainly he will not permit the dust of it to poison the air of public halls, opera houses and other assembly rooms. He will see to it that the ventilation of each occupied room is so planned that the current of air with its dust and germs shall be downward and not upward into the nostrils of the persons in the room.

Typhoid Fever.

Typhoid fever causes about ten times as many deaths in Michigan as small-pox does; probably about one thousand deaths per year; and most of these deaths should be prevented. The greatest number of deaths from typoid fever is of persons in the prime of life, and this should prompt to greater efforts for the prevention of this disease.

The most common modes of spread of typhoid fever are not the same as of small-pox, and consumption; consequently the measures for its restriction and prevention are not the same. The little phamphlets on this subject issued by the State Board of Health, and freely distributed here, contain plain directions how to prevent typhoid fever, and how to restrict its spread in communities. It is now believed that typhoid fever is most frequently spread by means of the drinking water, that the microscopic cause of the disease is probably reproduced in the intestines of persons who have the disease, and that this specific cause gains access to the drinking water by filtering through the soil, and sometimes by being washed into wells or streams from which the drinking water is drawn. The noted instance at Lausanne, Switzerland, where the discharges from typhoid patients were thrown into a small stream, which disappeared by sinking into the earth and gravel, and reappeared about a half mile distant as a mountain spring, the clear water of which caused typhoid fever in 144 persons, is instructive, and is useful for us to hold in mind as illustrative of how the disease may be spread. In this vicinity the usual mode of spread is probably by way of the privy vault and the neighboring well. The facts concerning the outbreak at Lausanne prove (and the same has been indicated in other instances) that the cause of typhoid fever sometimes passes great distances by way of the underground water flowing through strata of gravel.

The prevention and restriction of typhoid fever requires the disinfection

of all bowel discharges from those sick with such disease, and constant watchfulness of the sources of supply of water for drinking and culinary purposes. All water from a suspected source should be boiled before its use. Numerous instances are recorded where typhoid fever has been spread by the rinsing of milk cans with water apparently pure, but really infected with the germs of typhoid fever, capable of infecting the milk. This teaches us the importance of having water free from typhoid infection for all houshold purposes.

There is not time at my disposal to give all the evidence proving the enormous saving of human life from the ravages of typhoid fever which in recent years has been accomplished because of such knowledge as this to which I have just alluded; but I wish briefly to refer to some of this evidence. In a pamphlet published by the Michigan State Board of Health, and entitled "The Influence of Sewerage and Water-Supply on the Death-Rate in Cities," Mr. Erwin F. Smith, shows conclusively very great reductions in the mortality from typhoid fever in many of the great cites in this country and in foreign countries, the reductions in the typhoid mortality following the introduction of systems of sewerage and general water-supplies. For instance, in the City of Munich the death-rate from typhoid fever in the period from 1854 to 1859 was 24.2 per 10,000 inhabitants, while in 1884 it had declined to 1.4 per 10,000 inhabitants; that is, before the city was sewered, and while it was supplied with water from wells, the mortality from typhoid fever was about seventeen times as great as it was after the city was well sewered and had a good general water-supply.

To give you a mental image of this important subject, I have had copies made of two diagrams prepared by Mr. Erwin F. Smith to illustrate his paper, and they are here for distribution to such of you as will study them.*

Typhoid fever is a disease which in my opinion, it is important that citizens of Battle Creek should understand, because of the nature of the soil and earth underlying this place. Sooner or later there will come a time when no ordinary well in such a place can be safely relied upon to supply water free from the specific cause of typhoid fever.

But the general water-supply of cities and villages is a matter of the greatest concern, and it should be procured from places where there can be no probability of immediate or remote contamination. The well-known outbreak of typhoid fever at Plymouth, Pa., where over a thousand cases and 114 deaths occurred, is apparently an illustration of how great a calamity may follow the fouling of a *general* water-supply by the discharges of a person sick with typhoid fever.

If there should be in Michigan such a reduction of the mortality from typhoid fever as was secured in Munich through better sewerage and water-supply, there would be a saving of over nine hundred lives per year, and over 9,000 cases of sickness per year. To point out how such favorable conditions for healthful existence may be secured, is one of the objects of such sanitary conventions as this.

Let us pass now to the consideration of diseases which are fatal chiefly to children.

Diphtheria.

About eighty-five per cent of all the deaths from diphtheria are of children under ten years of age. Grown people have diphtheria, but it is usually considered only an ordinary sore throat, and proper precautions

* Pages 10 and 11.

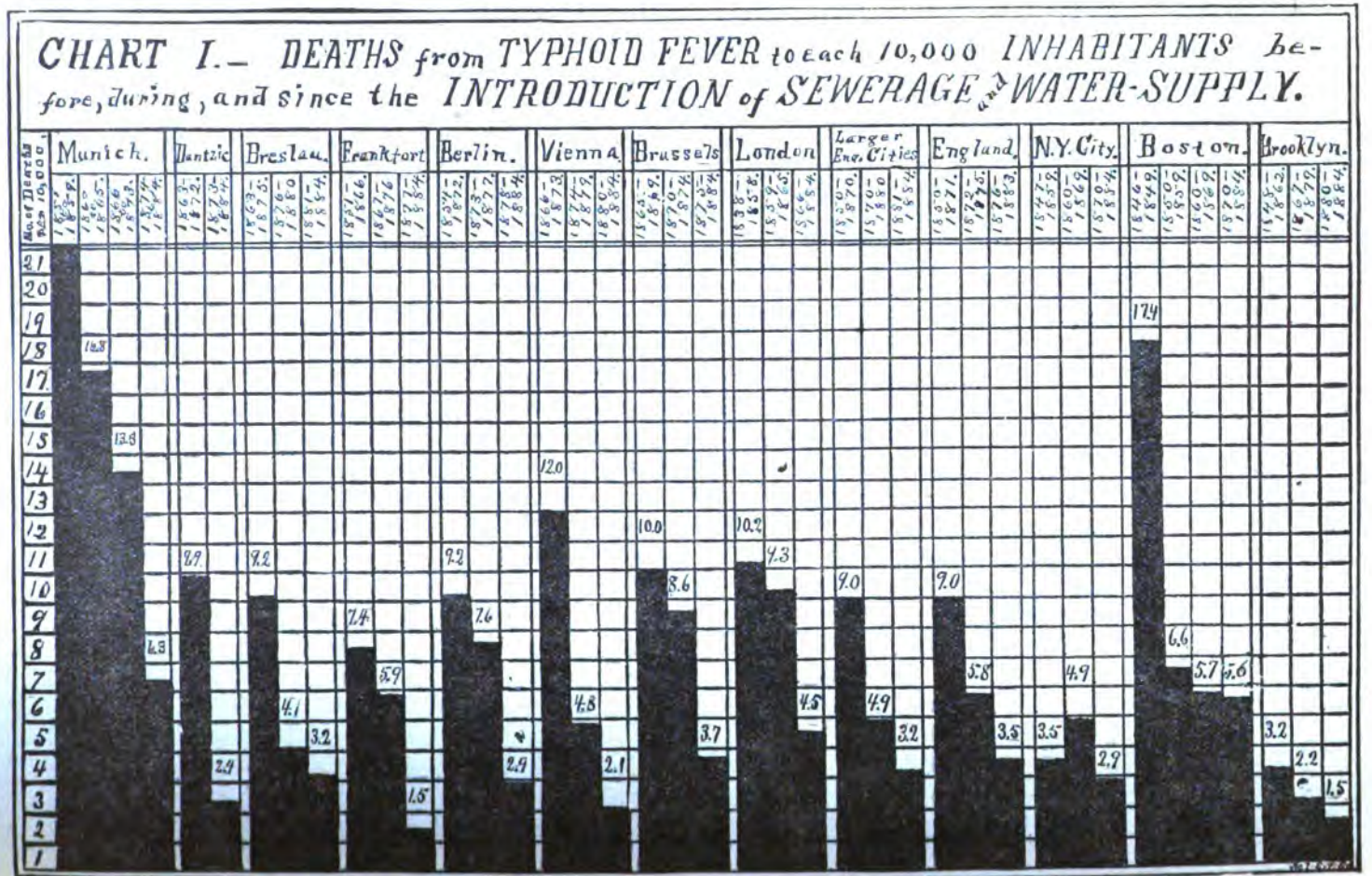
CHART I.— DEATHS from TYPHOID FEVER to each 10,000 INHABITANTS before, during, and since the INTRODUCTION of SEWERAGE and WATER-SUPPLY.
Munich.
Dantzic
Breslau.
Frankfort
Berlin.
Vienna
Brussels
London
Larger Eng. Cities
England.
N.Y. City.
Boston.
Brooklyn.
12.8
13.6
4.3
2.9
2.9
9.2
9.2
4.1
3.2
7.4
5.9
1.5
9.2
7.6
2.9
12.0
4.8
2.1
10.0
8.6
3.7
10.2
9.3
4.5
9.0
4.9
3.2
9.0
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6.6
5.7
5.6
3.2
2.2
1.5

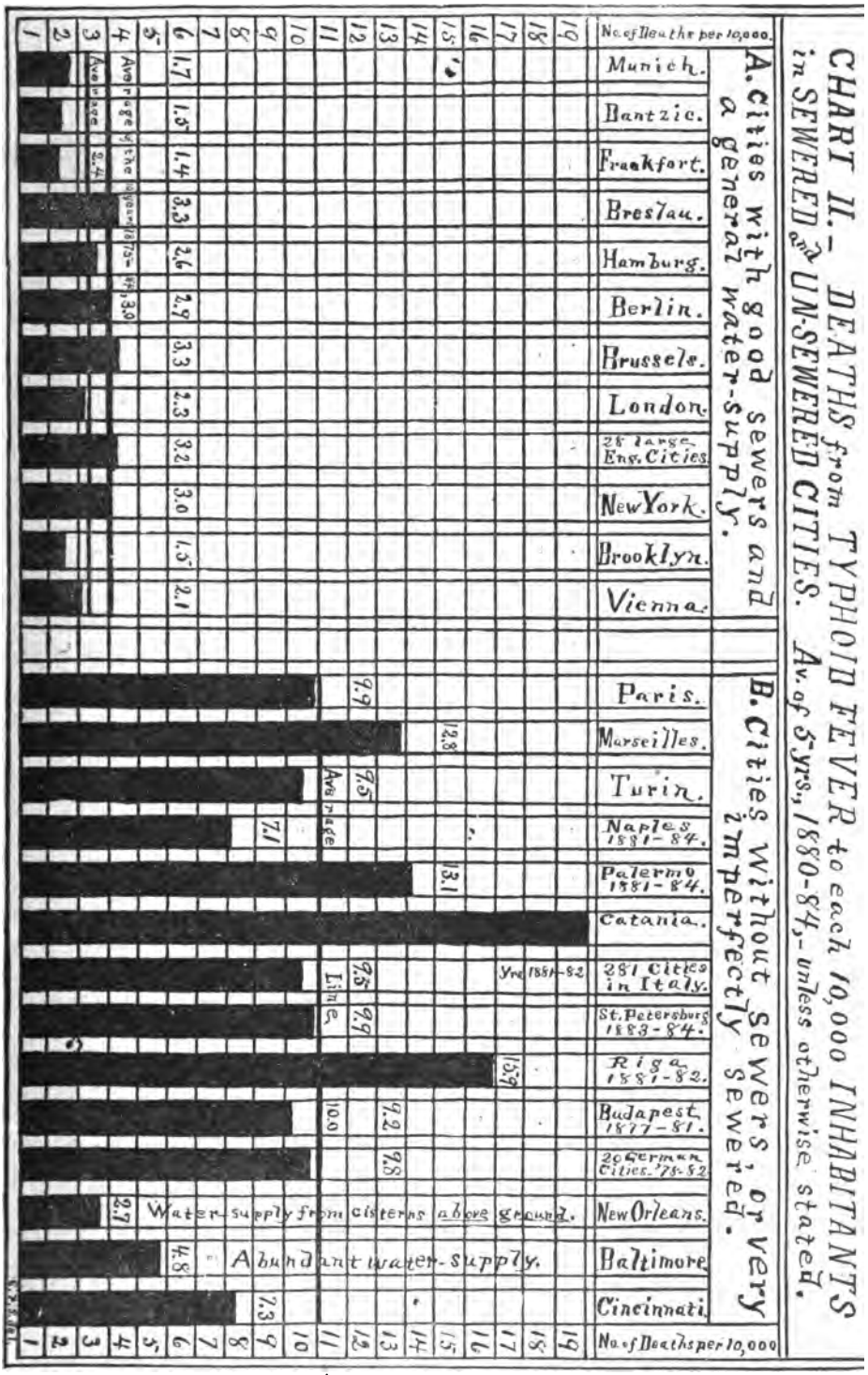


CHART II. — DEATHS from TYPHOID FEVER to each 10,000 INHABITANTS in SEWERED and UN-SEWERED CITIES. Av. of 5 yrs., 1880-84, — unless otherwise stated.
A. Cities with good sewers and a general water-supply.
B. Cities without sewers, or very imperfectly sewered.
No. of Deaths per 10,000.
Munich.
Dantzic.
Frankfort.
Breslau.
Hamburg.
Berlin.
Brussels.
London.
28 large Eng. Cities.
New York.
Brooklyn.
Vienna.
Paris.
Marseilles.
Turin.
Naples 1881-84.
Palermo 1881-84.
Catania.
281 Cities in Italy. 1881-82
St. Petersburg 1883-84.
Riga 1881-82.
Budapest. 1877-81.
20 German Cities. 78-82.
New Orleans.
Baltimore.
Cincinnati.
Average of the 10 years 1875-84, 3.0
Average 2.4
Average
Lines
Water-supply from cisterns above ground.
Abundant water-supply.

to prevent the spread of the disease are not taken. This ought to be generally known, and many more lives can be saved when all our people come to understand the facts.

In Michigan diphtheria causes about seventeen times as many deaths as small-pox does. I think it is probably more contagious than small-pox; because the spread of diphtheria is not usually so easy to trace, and yet we know that diphtheria is contagious, because it is sometimes very easy to prove this, and to trace its mode of spread. Diphtheria seems to be more frequently spread by indirect means than small-pox is; because if it were not, we ought to be able to trace the spread of diphtheria as easily as we do the spread of small-pox. But whether diphtheria is more or less contagious than small-pox, one important reason why we suffer so very much more mortality from diphtheria than from small-pox is the fact that for diphtheria we have no such preventive measure as vaccination.

Diphtheria is prevented by keeping away from where the disease is, and from everybody and everything that has been near the disease, keeping away until everything has been disinfected. In order that this shall be possible it is essential that every place where diphtheria is, shall be promptly reported and plainly placarded. The law requires the local board of health to "give public notice of infected places," and to "use all possible care to prevent the spreading of the infection." Another law requires the health officer to "give public notice of infected places by placard on the premises, and otherwise if necessary." Common humanity requires of every person that he do his utmost to fulfill the letter and spirit of all such laws for the public safety against such a terrible disease as diphtheria.

The law was amended at the last session of the Legislature, and its provisions should be generally known. Every householder, hotel keeper, keeper of a boarding house or tenant is required to report to the local health authorities, diphtheria and any other disease dangerous to the public health, and whoever fails to do this is liable to a fine and to imprisonment if the fine is not paid. Physicians are required to report, and if the physician reports the householder is excused from that duty. Health officers, unless otherwise ordered by the local board of health, must take prompt, thorough, and efficient measures to stamp out the disease; and if they neglect their specified duties they are liable to a fine and to imprisonment if the fine is not paid.

But however good the laws may be, their execution depends upon the enlightened public sentiment of the locality, upon the people themselves, from whom the prompt notice should go to the local health officer, upon intelligent and faithful local officers who should perform duties which are of the highest importance to the people.

For obvious reasons, the compensation of the health officer should be greater than he can obtain for the same time by the regular practice of his profession as a physician,—the highest interests of the public demand that he shall have a greater money interest in the prevention of sickness than in the treatment of sickness which should have been prevented. The law now requires more of the health officer than it formerly did, and provides severe penalties for neglect of duties connected with diseases which endanger the public, while if the health officer performs those duties he may sometimes sacrifice all income from the practice of medicine; accordingly, his compensation should be greater than formerly, and it should be not only adequate but certain, so that in each locality a

good man will accept the very important position of guardian of the public health.

There is one more requirement for the restriction of all of these dangerous diseases. It is a delicate point to mention, but it is important that the physicians around the State shall be able to know one of these diseases when they treat it. The fact is that in each of the outbreaks of small-pox in recent years that have spread, the doctor called to treat the disease did not recognize it—called it chicken-pox. It is a common thing for scarlet fever and diphtheria to be treated as some harmless ailment, and consequently to be allowed to spread. Typhoid fever is, sometimes, not recognized and reported to the health officer. All this indicates that the greatest safety of the people would require that all who advertise or set themselves before the people as practitioners of medicine should have certain qualifications,—they should be required to know the characters of the most common and most fatal diseases, especially those which are communicable and which therefore always endanger the public.

If you think as I do on this subject, you can ask the Legislature to give you such a law. My own duties are mainly with the execution of laws, but in the performance of those duties we sometimes see, or think we see, how the laws might be improved.

Scarlet Fever.

Scarlet fever is a disease to be dreaded on account of the mortality which it causes and also on account of the permanent injuries which result from it. Thus, as an instance, of 263 pupils in the Michigan State School for the Deaf, at Flint, during the years 1887–8, who became deaf since their birth, the loss of hearing of 42, or 16 per cent, is attributed to scarlet fever.* Of the 114 pupils in the Michigan State School for the Blind, at Lansing, during the two years 1887–8, who became blind since birth, seven, or 6.1 per cent lost their sight from the effects of scarlet fever.†

In Michigan, scarlet fever causes about nine times as many deaths as small-pox does. The only *preventive* is to keep away from the disease, and to allow no person or article infected with the scarlet fever contagium to come near a person susceptible to that disease.

For its restriction, except that there is no vaccination, all the measures proper in the case of small-pox are proper in scarlet fever.

Inasmuch as scarlet fever causes nine times as many deaths as small-pox does, the importance of prompt notice to the health officer is at least nine times as great as it is in small-pox.

All the other measures should be promptly and thoroughly executed. I will not stop to give you details. They are published in our pamphlets here for distribution.

Practical Results in Restricting Scarlet Fever.

At the close of the year 1887, the statistics published by the State Department, showed that the mortality from scarlet fever in Michigan had been reduced in the years when the measures recommended by the State Board of Health had been to some extent fulfilled, so that over five thousand six

* 18th. Biennial Report of the Board of Trustees of the Michigan School for the Deaf.
† Report of the Superintendent of Public Instruction, Mich., 1888, pages 78–80.

hundred persons had lived who under the old mortality rate, before the Board began its work, would have prematurely died.* This is an average saving of four hundred lives per year—rather more than a life every day for fourteen years—saved from that dread disease, scarlet fever.

But we have other evidence than the mortality statistics, showing the great saving of life which it is possible to have in Michigan through such measures for the restriction of scarlet fever as I have briefly outlined. The experience of the local health officers in restricting scarlet fever in this State is reported each year to the State Board of Health; and a compilation of these reports shows that in those outbreaks in which isolation and disinfection were neglected there were about five times as many cases and about five times as many deaths as in those outbreaks in which they were enforced.†

This is about equivalent to saying that four-fifths of the cases and deaths from scarlet fever are known to be preventable through measures which we can describe in three words—*isolation and disinfection.*

Practical Results in Restricting Diphtheria.

While on the subject of the saving of life in Michigan, I may mention that the experience of the health officers in restricting diphtheria in this State is also reported each year to the State Board of Health, and a compilation of these reports shows that 833 lives were saved and 4,374 cases of sickness prevented from diphtheria in Michigan during the year 1886, and that in the year 1887, 518 lives were saved and 2,371 cases of sickness prevented; during 1888, 416 lives were saved and 3,292 cases prevented. Thus during the three years 1886, 7 and 8, over ten thousand (10,037) cases of sickness were prevented, and more than seventeen hundred (1,767) lives were saved from diphtheria in Michigan. Or, another way of stating this is to say that during the last three years the *known* saving of life in Michigan from diphtheria has averaged one and a half persons per day.

You may be interested to know the method of estimating the number of cases prevented and lives saved by means of isolation and disinfection. It is as follows: Muliply the *whole number* of outbreaks by the average number of cases and deaths in the *neglected* outbreaks, and the product is the probable number of cases or deaths which would have occurred if *all* outbreaks had been neglected. Deduct from this the number of cases or deaths which actually occurred, and the remainder is the indicated number of cases of sickness prevented or lives saved by the efforts made to restrict the disease.

As the local health officers report to the State Board of Health the number of cases and deaths in outbreaks of diphtheria, and also report just what was done (in each outbreak) to restrict the disease, we are thus supplied with the data necessary to learn the success which attends any line of action which is taken. [The diagram on page 16 exhibits graphically the experience in restricting diphtheria in Michigan in 1888.]

Practical Results in Restricting Small-Pox.

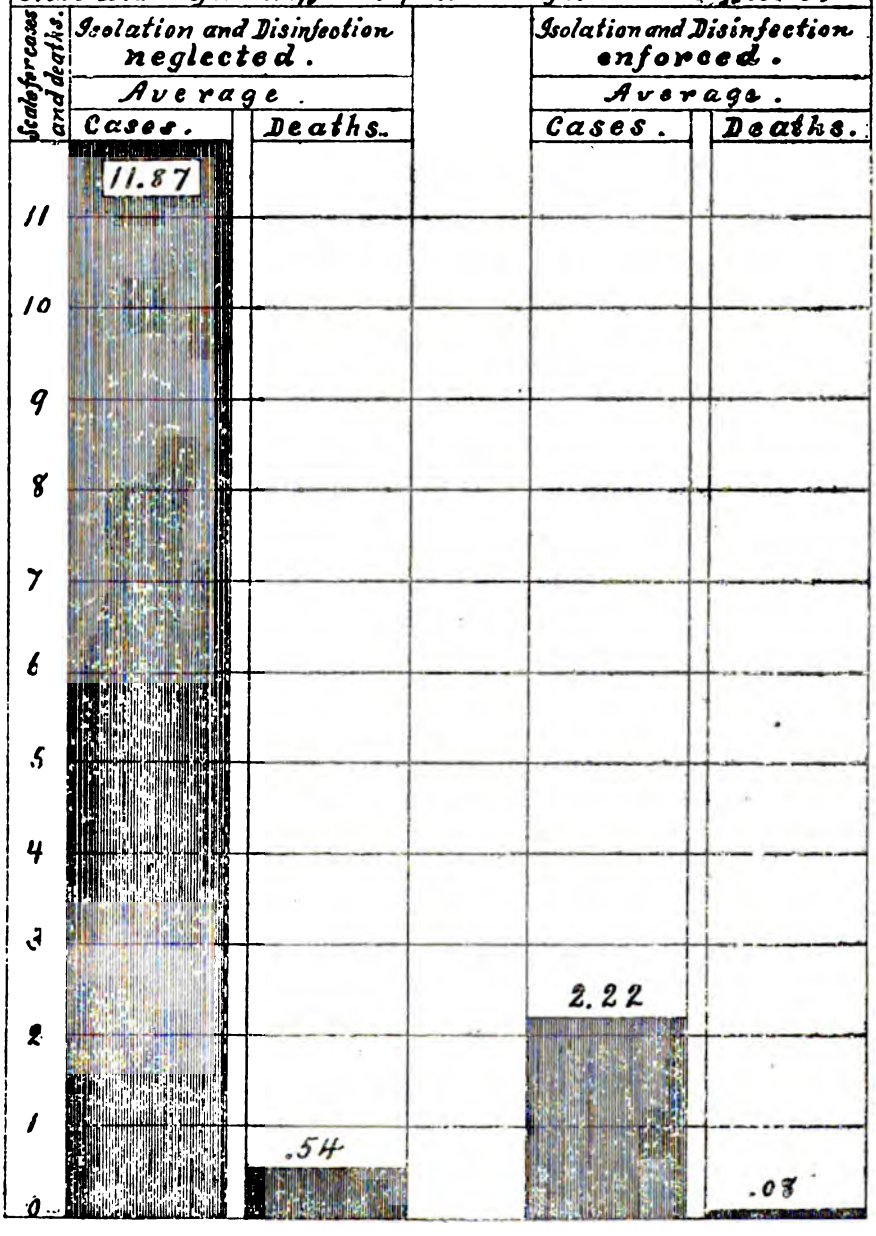
The statistics collected and published by the Secretary of State of Michigan, taken in connection with the facts on record in the office of the State

* This is shown on page 58 of the proceedings at the Vicksburg Sanitary Convention in last column of Exhibit 2, second line from bottom of the table.

† The evidence for one year, 1888, is shown in the diagrams distributed here, on page 15.

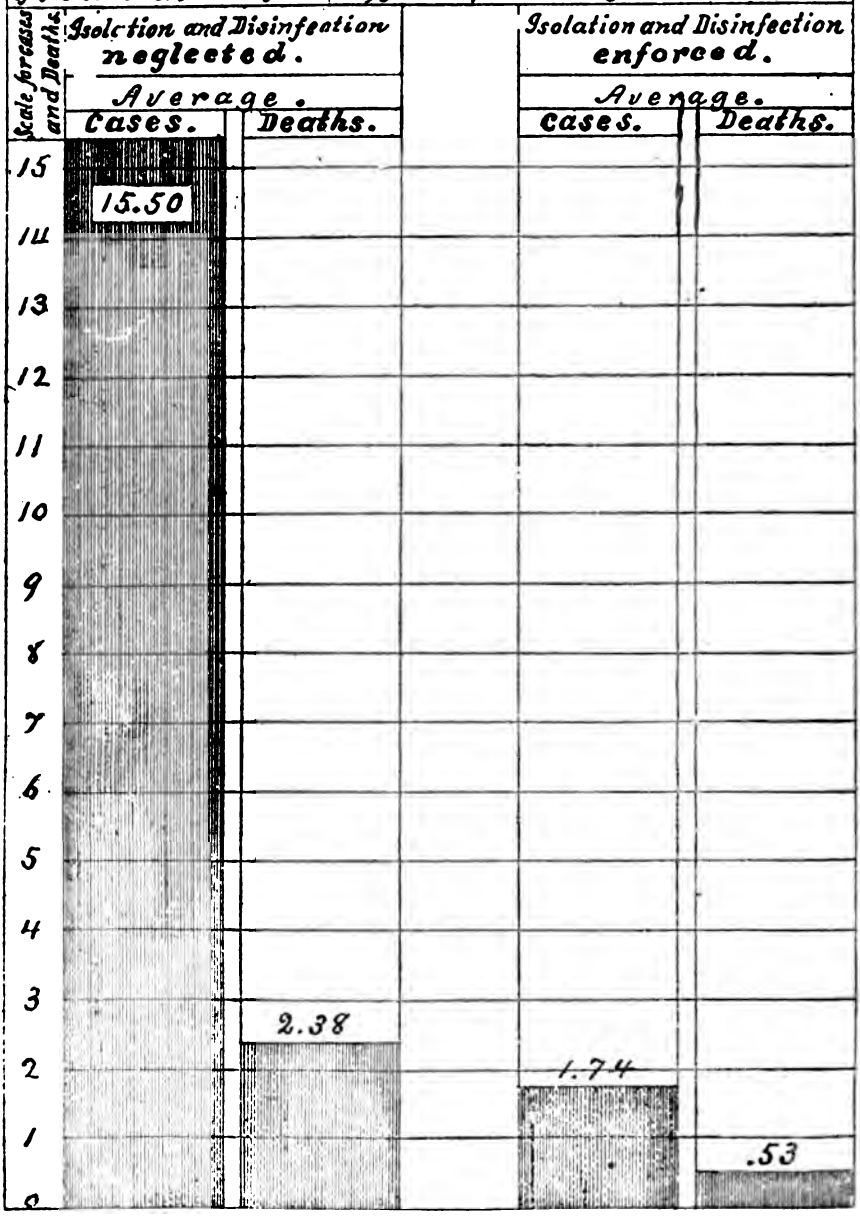
ISOLATION AND DISINFECTION RESTRICT SCARLET FEVER.

Scarlet Fever in Michigan in 1888:- Exhibiting the average numbers of cases and deaths per outbreak:- in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



ISOLATION AND DISINFECTION RESTRICT DIPHTHERIA.

Diphtheria in Michigan in 1888:- Exhibiting the average numbers of cases and deaths per outbreak:- in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



Board of Health, prove that in Michigan, through such measures as I have outlined, the mortality from small-pox has been reduced, and that if it had continued at the same rate as before the State Board of Health was established, more than one thousand five hundred persons in Michigan *would* have died from small-pox that have *not* died of that disease. This was true at the end of the year 1887, and since that time the mortality from small-pox in Michigan has not increased. The statistics now cover so many years that we think there can be no doubt of the reliability of their evidence.

There is reason to believe, however, that the facts which have been presented to you of the saving of life in Michigan are not all which might be presented, the evidence seems to me to be conclusive that more might truthfully be claimed; but as the record here stands it is one to which, as I said at the Vicksburg convention, "The State and local boards of health in Michigan can justly 'point with pride.' It is a record of the saving of over one hundred lives per year from small-pox, four hundred lives per year saved from death by scarlet fever, and nearly six hundred lives per year saved from death by diphtheria—an aggregate of eleven hundred lives per year, or three lives per day saved from these three diseases! This is a record which we ask to have examined, and which we are willing to have compared with that of the man who 'made two blades of grass grow where only one grew before.'"

The success which has already been achieved in dealing with scarlet fever, diphtheria, and small-pox should encourage all to more thoroughly coöperate for the restriction of those diseases, and also to enter vigorously upon the the work of restricting typhoid fever and consumption. The relative importance of these diseases can be seen by the diagram which is exhibited here.* I believe that one hundred lives per year have been saved from death from small-pox. The diagram is accurately drawn to scale, and correctly represents the relative mortality in Michigan from these important diseases which we believe are largely preventable. You can see for yourselves the tremendous opportunity which there is for life-saving work for the restriction and prevention of the dangerous communicable diseases in Michigan. I do not see how one can have a better field, or a nobler work, and I trust that we shall all do what we can in this direction.

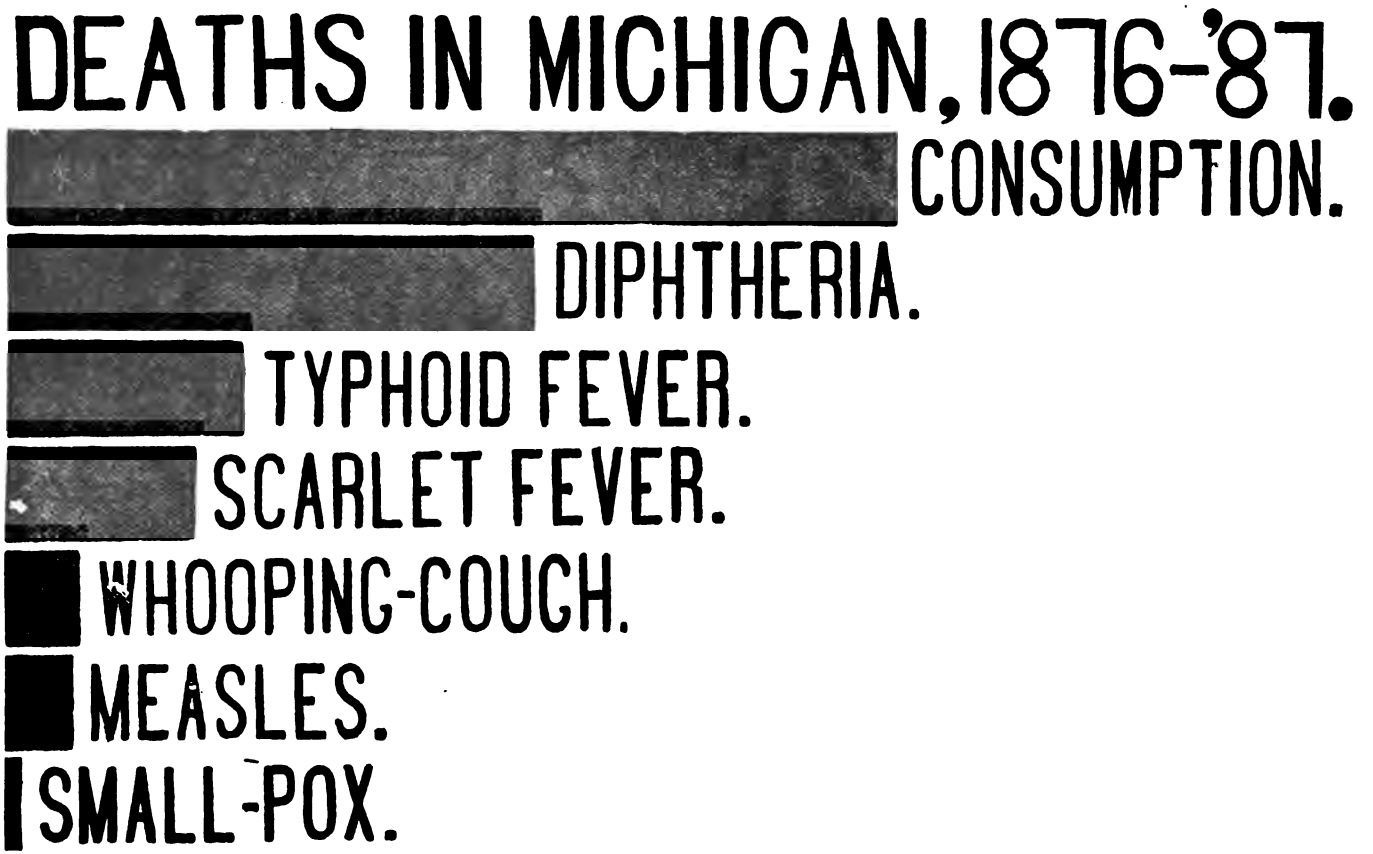
RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

DISCUSSION BY PROF. A. ARNOLD CLARK, LANSING.

In the discussion of this subject, Dr. Baker has marshalled the statistics of thousands of cases of sickness and I am sure that nothing could be added to the graphic picture he has presented of the importance of restricting these diseases. Without going over the same ground I might say a few words concerning the philosophy of restriction, and I know of no better way of illustrating this than by relating an incident in the history of science:—

If I were to ask you to name the great silk-producing district of the world, you would probably mention Southern France.

* The diagram, reduced in size, is printed on the page following this.


DEATHS IN MICHIGAN, 1876-'87.
CONSUMPTION.
DIPHTHERIA.
TYPHOID FEVER.
SCARLET FEVER.
WHOOPING-COUGH.
MEASLES.
SMALL-POX.

The people in Southern France practically do nothing else but cultivate silk worms. When they meet in the street, they say not "How do you do?" but "How are the worms?" These worms are to be found in kitchen and parlor. In 1853 the raw silk produced by the worms of Southern France was worth $35,000,000.

But suddenly a great plague broke out among them, and in 1865 the silk produced was worth only one-fifth what it was twelve years before. The worms were found to be covered with little black spots—looked as though they had been *peppered*, and so the disease was called *pébrine*. When these spots appeared the worms became sluggish, stopped growing and died.

That great Frenchman, Pasteur, studying one of the little worms with a microscope, saw that its silk glands—the glands containing the fluid which it would spin into silk—literally swarmed with little microscopic germs, and, though the worm itself was only one-half inch in length, so much smaller were the germs that he could see thousands of them swimming in the rivers of its body.

Rubbing up this worm in water, he spread the mixture over mulberry leaves, and

FED THE LEAVES TO THIRTY HEALTHY WORMS,

and in twelve days after they ate this infected meal every one of these worms was peppered with the characteristic spots of the disease, while the silk glands were literally charged with the germs.

Pasteur also found these germs on the claws of the worms, and saw that they communicated the disease by scratching one another with their claws. He also put a healthy worm in the same room with a diseased one, and it contracted the disease, showing that the germs of the disease might be carried through the air. He next discovered that moths contracting the disease invariably laid eggs which gave birth to worms which sickened and died without spinning silk.

Little faith was put in Pasteur's experiments until he took a number of eggs—every one of which the cultivators thought was healthy—and after examining the moths which laid the eggs, predicted, in a sealed letter, that twelve of these eggs would turn out diseased worms. At the close of the year the sealed letter was opened and read, and just those worms were found to be diseased which Pasteur had predicted, and those which he had pronounced sound yielded a healthy crop of silk.

Finally, by infinite painstaking, each of these little moths was placed, like a prisoner, in a numbered cell; the eggs were laid in numbered cells, each moth laying about 500 eggs. Those eggs which were healthy were hatched in numbered cells, the diseased ones were destroyed, and thus, by this infinite painstaking, Pasteur saved the worms and restored this crippled industry to France.

Now, as the germ of pébrine passing from worm to worm will cause a great plague among them, so there are other germs which will cause disease in man—germs which, passing from person to person, from town to town, have been known to take whole cities by storm, stagnate industry, paralyze trade and even depopulate nations. And just as Pasteur was able to infect healthy worms by feeding them leaves covered with the germs of pébrine, so you might go today to some biological laboratory where the germs or seeds of these other diseases have been made to grow in gelatine and you might infect yourself just as easily as Pasteur infected the worms.

You might inoculate a dozen different animals with these different seeds and produce in those animals a dozen different diseases, just as surely as a farmer may sow his farm with a dozen different kinds of seed and produce a dozen different crops. And as the seeds of thistles always produce thistles and not corn, so

THE SEEDS OF SCARLET FEVER ALWAYS PRODUCE SCARLET FEVER

and nothing else. Or, as Florence Nightingale used to say: "Scarlet fever can no more generate measles than a race of dogs can produce a race of cats." And if you could destroy the germs of these diseases today, you could destroy these diseases just as easily as Pasteur stamped out the silk worm plague in France.

Dr. Baker has told you which diseases were communicable, and before you, there hangs a diagram showing these diseases in the relative order of their danger, and they are all caused by a living germ.*

Dr. Baker told you how the germs of

CONSUMPTION

were found in the sputa from the consumptive patient. He might have added that they have been found on the walls of rooms inhabited by consumptive patients where, the sputa becoming dry, the germs have risen at every sweeping and found their way to the walls of the room, and perhaps to the lungs of the people in the rooms. You have seen wheat and you know that wheat always produces wheat. You have never seen the seeds of consumption, but the microscopist has, and he knows that these seeds will grow in the human lungs just as wheat will grow in a favorable soil. He knows that when the sputa containing these germs are sprayed into the air, and dogs are placed in the inhaling room to breathe this sputum dust, they become consumptive and die. Dr. Baker very properly asks you to prevent this disease by destroying all expectorations from consumptives before they have an opportunity to dry and scatter their seeds. If this recommendation were only partly carried out, many lives might be saved in this State every year.

But, you ask: Is it necesary to shut up the consumptive—keep him from his family and friends? No; because the germs of the disease are not found in the breath. Bollinger caused a consumptive to breathe on a surface covered with glycerine and he caught no germs. Grancher caused a consumptive to breathe two hours a day for many days in an air-tight rubber bag filled with guinea pigs, and the guinea pigs did not contract the disease. The main danger is in the dried sputa from the consumptive.

The essayist has pointed out how the germs which cause

TYPHOID FEVER

are carried in the water we drink. This necessitates guarding the purity of our water-supply. But as this is not always possible, indeed, as there is always a doubt about the purity of water in shallow wells, we should remember that thoroughly boiling the drinking water will protect us, for boiling the water will destroy the germs of typhoid fever, just as boiling

* The diagram reduced in size is printed on page 18

your fruit (for canning) will destroy the germs of fermentation in the can.

But, as you have seen, the efforts of the State Board of Health are principally directed to the restriction of these two diseases,

DIPHTHERIA AND SCARLET FEVER,

which cause between them the death of one person in every twelve who are born into the world. Now just so surely as Pasteur, by isolating the sick from the healthy worms, was able to stamp out the plague and save the life and labor of the worms, so by exactly the same method the State and local Boards of Health of Michigan are saving each year the lives of hundreds of citizens, and if France could afford to spend thousands of dollars to save its worms, and if the life of the man who reels the silk is worth as much to the State as the worm that spins it, then the State can well afford to spend a few thousand dollars to maintain State and local Boards of Health to protect us from these dangerous communicable diseases.

Now, those of you who have heard that the State Board of Health was simply a bureau for the collection of statistics, have learned today how much those statistics mean. For example, when a health officer reports to the State Board of Health that* he did not isolate patients sick with diphtheria, that he did not disinfect premises, and that he had fifteen cases of the disease and three deaths, that is a statistic (if I may use that word); when another health officer reports that he did disinfect, and that he did isolate patients, and that he had only two cases and no deaths, that is a statistic. But when thousands of health officers make similar reports, they are statistics, but they are still all rubbish until some use is made of them —all in the dark—all in the clouds. But when these facts are placed side by side as in the diagram before you*, and when it is seen that uniformly where these precautions were not taken there were five times as many cases and five times as many deaths as in those outbreaks where these precautions were carried out to the letter, that is the compilation of statistics; that is where the lightning flashes from the clouds. These facts have been collected, for both diphtheria and scarlet fever, for three years running, and, though only one year is represented in the diagrams which I present,† facts covering three years, over five hundred outbreaks of diphtheria, over forty-three hundred cases and over nine hundred deaths show a similar result.

Now, just so surely as Pasteur could predict that those worms which ate the infected meal would sicken and die while the others would not, so

WE CAN PREDICT THAT WHERE THESE PRECAUTIONS WERE NEGLECTED

there will be (on the average) five times as many cases and five times as many deaths as where the instructions of the State Board are carried out,‡ and in this way we are able to prove, that thousands of lives have been saved by those health officers who have isolated patients sick with these two diseases, and after death or recovery have disinfected with the fumes of burning sulphur to destroy the germs.

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* From some cause, perhaps beyond his control.

† Pages 15 and 16.

‡ First two paragraphs on page 14, and pages 15 and 16.

Now, how has this saving of life in Michigan been accomplished? Because the Michigan Legislature has given the State Board of Health the proper machinery for carrying out its recommendations. There is probably no State in the Union where better health legislation has been secured than in Michigan, and as a result, there is no State which can now point to so great a saving of human life. Our State Legislature has provided that the common council of every city, the common council of every village and the board of supervisors of every township, shall be the board of health, and such shall constantly have a well-educated doctor as health officer, and report his name to the State Board of Health. Last year nine-tenths of the fifteen hundred localities in the State complied with this law.

More than that—every physician is required by law to report at once to the local health officer, every case of a dangerous communicable disease in his practice, and the physicians of Michigan have learned that doubtful cases should be reported, for malarial fever may turn out typhoid, scarlet fever may be mistaken for German measles, croup may turn out to be diphtheria, and it is better to run on a false alarm than to miss a fire. If the physician fails to make this report he is liable to a fine. Every householder is required to report at once to the health officer every case of a dangerous communicable disease in his house, and he is fined if he fails. If he fails to pay the fine, he is liable to imprisonment in the county jail.

The health officer is required to report at once to the State Board of Health, to isolate every case, to placard houses, to personally disinfect after death or recovery, and if he fails in any of these things he is liable to fine and imprisonment in the county jail.

More than this, any person who tears down the placard or in any way violates the orders of the health officer is liable to fine and imprisonment in the county jail.

Now, there may seem to be a good deal of "county jail" about this, but the time has come for people to understand that it is a misdemeanor—aye, a crime, for a man sick with a communicable disease to expose a neighbor and kill him. We very properly boast in this country of our Saxon independence, and cry out against so-called sumptuary laws which needlessly interfere with personal liberty. The time was when nearly everything was regulated by law. In the old Massachusetts Colony a law was passed requiring the sleeves of all dresses to reach to the wrist and prohibiting anyone worth less than two hundred pounds wearing lace which cost more than two shillings a yard. Men who wore long hair were liable to imprisonment. I saw not long ago in the *Central Law Journal* a copy of a law still on the statute books of New Jersey, passed when that State was a British Colony, which reads: "All women of whatever age, rank, profession or degree, whether maids or widows, who shall, after this Act, impose upon, seduce and betray into matrimony any of the King's subjects by virtue of scents, cosmetics, washes, paints, artificial teeth, false hair, or high-heeled shoes, shall incur the penalty of the law now in force against witch-craft and like misdemeanors."

All of this is sumptuary law—a needless interference with individual liberty. Government has no right to interfere with the liberty of one man except where that man interferes with another's rights, but if

ALL MEN HAVE AN EQUAL AND INALIENABLE RIGHT TO LIFE AND LIBERTY,

it is the business of the State to maintain that right, and no man has any more right to go upon the street and infect you with the germs of disease, so

that you sicken and die, than he has some dark night, to knock you on the head, and the government which punishes the one offense should punish the other.

Now you would naturally think that a State so careful to make such stringent legislation for the prevention of disease would be careful to pay most handsomely those required to execute these laws. But let us see how much we really pay in Michigan for the prevention of disease. How much do you pay in Battle Creek? You have in this city about forty-five physicians. I suppose they average an annual income of about one thousand dollars each. That makes about forty-five thousand dollars which you pay each year to cure you after you get sick. Now how much do you pay to prevent your getting sick? Probably, not more than one hundred dollars. You have a health officer and you probably pay him about one hundred dollars a year to stamp out communicable diseases in Battle Creek. Now prevention is better than cure. It is all right to pay these doctors a thousand dollars each to cure you after you get sick but you should pay one man at least one thousand dollars each year to devote his entire time to the stamping out of disease and yet we, who pay so much to cure disease, would probably grumble at a tax of five cents apiece to prevent disease. Some people seem to think that because they always have lived, all money spent to prevent disease and dying, is money wasted. You have heard of the man who dropped his life insurance because he had kept the thing up twenty years, and never derived any benefit from it yet. That seems too often to be the policy of the city, the State, the nation. It has been said today, that the local board of health should be as active as the fire department on the outbreak of a fire. You pay about five thousand dollars each year for the maintenance of your fire department to save your property from fire, and this is proper. But how much more reason is there for maintaining in every community an active and well-paid sanitary fire department to extinguish a conflagration of some dangerous communicable disease.

THE COMMONWEALTH AND THE COMMON HEALTH.

BY HON. CYRUS G. LUCE, GOVERNOR OF MICHIGAN.

(Reporter's Abstract.)

Mr. Chairman, Ladies and Gentlemen:

Although I never venture upon the discussion of scientific questions, I often gaze with admiration upon those who are qualified to present scientific facts and discuss scientific matters. I have listened to these learned addresses here this afternoon, and lest I may forget it later in the talk, I want to say that if it is the purpose of the Board of Health, to continue the lives of individuals forevermore, I have no sympathy with their efforts. If it is their purpose to enable men and women, boys and girls to enjoy good health while they do live, I am in entire sympathy with their efforts, and wish them success. I thought of this when they were speaking so rapidly in relation to the number of deaths caused by those diseases, unnecessarily.

Now, I came here for two reasons. In the first place, I received an invitation; and I attend all the meetings that it is possible for me to attend. Day before yesterday, I attended the graduating exercises of the School

for the Blind. Yesterday, I was at Ann Arbor; today I am here; tomorrow I am to be at Hope College, at Holland, and Saturday I go to talk to the Pioneers. So, I have become quite used to going out, and for that reason I come when I am invited. But I came here for another reason. This Board of Health belongs to the State Department. It is a department of the State Government, and the Members of the Board of Health are appointed by the Governor. The law makes it his duty to select the men who are the best qualified to discharge the important duties of the members or the Board of Health. And I go out, whenever I can, to see that these men are earning their money, and discharging their duties loyally to the people and the State. This is not the first time I have been out with them, but this is the first time that I have been asked to talk in relation to the Commonwealth and the Common Health.

In the civilization which controls our actions today there is a great change from that existing fifty or even thirty years ago. All the relations of man to man, and man's to the State, and his duties are changed and enlarged. Public sentiment has changed; the agencies employed are widely different from those heretofore employed in this country of ours. In the first place, we have more religion in the world today than we ever had before, and we are all the while getting more of it. Still, there is room in the world for a great deal more than we have. The religion of today which controls civilization, and to some extent controls the destines of men, and of nations, is creating a broader and higher humanity. This was first developed in the education of the mind,—the development of the mental faculties. This civilization has created the necessity for greater and more universal knowledge, and the development of the intellectual forces. We seize hold of this, and now have an opportunity for a complete comprehension and understanding of this law of our civilization. So we reach out, and it has become a settled policy of the government to educate all of our children. Every boy and every girl is afforded opportunities to secure an education. And the law goes one step further, and is compulsory in its character and provision. We realize fully that, to maintain the State, the Commonwealth of Michigan must educate and train the children. Formerly that word was almost universally applied to the Government of Massachusetts, and it was only later that other States aspired to the name of "Commonwealth." When I was a boy, I almost thought that Massachusetts was the only State that had a right to call itself "Commonwealth;" but now, when Michigan is in the advance in all the elements of grand civilization, even of Massachusetts, we find ourselves entitled to the name, and so it is the Commonwealth of Michigan of which I talk to you to day; and in this Commonwealth, as I said, it has become the settled policy to educate and train all of its children, all of our boys and girls. We do this not solely and alone because of the sympathy for the boys and girls, but because the welfare of the State, the stability of the Commonwealth, demands it at our hands. Thus the property of the State is compelled to contribute to the education of the children, because the property of the State is better protected by an educated population than by an ignorant one. There is no policy so thoroughly well established as the one that dictates universal education.

And now let me ask right here, what is the use of educating the brain, if the physical structure is debilitated and weakened? If we are unhealthy, and debilitated, sick, lame, halt and blind, what is the use of the development of the intellectual powers?

We begin to reason a little beyond that, and we see around us unfortunate people. We see that portion of our people who are suffering a greater affliction than any other, the insane, needing care from the public. While I am a pretty young man, yet, I can remember back to the time when this Commonwealth of ours, this grandest of the Commonwealths, had no place to care for and treat the insane. Those who were deprived of their reason and the control of their own powers, and of their destinies, were uncared for by the public. Well, in the days of advancing civilization, we were educated to the fact that these unfortunates must be cared for. When I was first a member of our State Legislature, we had no instituion in the State of Michigan for the care of these insane. I recollect of speaking of this once before, in the State, and some one said: "Why, what a perfect Methuselah that man must be!" And when I tell you that it is not yet thirty years in the State of Michigan since we first opened the asylum at Kalamazoo for caring for these unfortunates, you will see that a man who witnessed that might be living now, and still not be so old as Methuselah. This is one of the effects of our advancing civilization. Now in our State institutions, we care for 2,800 of these unfortunates. We treat them well, we watch them, we feed them, and we clothe them; we do everything that skill and medical aid can do to restore them to reason and usefulness. So, there is one case where the health is protected, and the reason is gained, if possible; and where that obligation devolves on the Commonwealth because of its interest in the common health, to take these unfortunates in our arms, and treat them, and care for them.

We go one step further; we see around us the blind, with no ray of hope to light up the horizon of their lives. And the State, as well as other States, following along in the advance of this civilization, reaches out its arms and takes those unfortunate blind ones. In talking to them night, before last, I ignored the fact of their misfortune, but they are not here this afternoon, so I will admit that they are unfortunate, indeed. But we do relieve them, to a great extent of that misfortune. Why, I recollect one of them (in graduating the other night) reading an essay on Oliver Goldsmith, reading by means of raised letters, passing the fingers over them, and another had a "History of the Education of the People." What is the particular use of these people doing this, becoming educated? It relieves them to a great extent of their misfortune, and educates them as well.

I like the doctors! I like them first rate, but I never want to be brought directly in conflict with them. I presume that I am not singular in this respect. And I want to say that it is an advantage for the people to gain the information and the experience of their studies, so that it is well that you come to these conventions. With this information, this scarlet fever, which is the dread of our households, may be prevented, if we only do our duty.

Now, I wish to talk a minute about the law,—the law of the Commonwealth. It is the duty of the Governor to see that the laws are enforced; it is a constitutional duty. There is a duty imposed on boards of health for the enforcement of certain laws throughout the State relative to the prevention of disease; and it is their duty to see that those laws are enforced, and if public sentiment were to enter into their efforts, they could more easily perform their duty in that regard. So, these sanitary conventions

are for the purpose of calling your attention to your rights, and your duties, as citizens of this Commonwealth.

As before the war there is a real cash value attached to every human being. That is, men and women earn so much wealth to the Commonwealth. If they enjoy a good, high degree of health, vigor and strength they are of greater value to the Commonwealth as wealth producers than are the feeble, sick and puny, and in the coming years the Commonwealth is going to understand more fully these rights, and its duty in relation to the enforcement of the provisions that will insure the health of the citizens, not only through sympathy with the individual, but we, as a State have claims upon the individual to make the most of his power. There are some things that we can do to prevent the spread of disease, and I believe that we will take up these questions, in the future, and the commonwealth will exercise its rights more than it has in the past.

Now, I want to be pardoned for a few minutes, not for criticism, but to point out to this assembly this afternoon some things that must be done, in order to accomplish that purpose. Now, way back, it was the individual who was in danger of losing his liberty, but we, in this Commonwealth, at all events, and I believe in the Union, endeavor to see to it that the rights of the individual citizen are guaranteed. But in protecting the rights of the individual, and in guaranteeing to him his priviliges, we are in danger lest the public rights, the rights of the Commonwealth are ignored. And now, I desire to measure my words when I say that the greatest obstacle in the way of securing public rights, corporate rights, the freedom and purity of the Commonwealth, rests with the Supreme Court of the United States. They are still lingering along tho line of the common law. They are still according the rights of the individuals, and corporations, as they construe it. And it has not been so painfully illustrated as in the decision recently made, which involves the right of the people to protect the health and purity of the fathers of families.

I know of nothing since the Dred-Scott decision, when the court declared that black men enjoyed no rights that white men were bound to respect, that is so dangerous to the best interests of the Commonwealth, as that one decision that has gone forth, affecting the rights of communities and of States in this old nation of ours. I am not blaming the Supreme Court. It is never considered just the thing to do, to criticise it. That decision was fairly rendered, I doubt not, as they understood it. But they are lingering along the pathway of the old civilization. They are going back to the old common-law doctrines. Now, I hold here, that no man has a right to endanger his health, and injure the health of his posterity by becoming a drunkard. I say to you, that in the coming years this Commonwealth will rise, and stand up in its might and majesty and say: "Here is a decision that must be taken care of." Why, they talk about dying, from the germs and poisons. Well, that is all true. But here is a poison that impresses itself more forcibly than all, on the weaker persons of the State, and I say to you that the very mental and moral health is destroyed by the use of these intoxicating drinks; they poison the blood of the children, and, in the interest of the health of the Commonwealth, we must keep men from this great evil, and protect the rights, the health and the well-being of society. We must create a public sentiment so high, so holy, and so earnest that it will enable us to prevent this great destruction of our citizens and their children, and so we shall preserve the health of the people of the Commonwealth. Now, this is one of the things, I trust, that we hold sani-

tary conventions for. This is one of the things that I would point out. Let us so stimulate public sentiment, that it will hold the Commonwealth responsible for the violation of a law of health, one that is absolutely essential to the prosperity and happiness of the people of the State.

So, in accordance with civilization, it is a responsibility of the Commonwealth to look after the health of the people of the State, and their rights, some of which they will realize hereafter more fully than now.

The afternoon session closed with a solo by Miss Maud Richardson of Chicago, which received a hearty encore.

Second Session, Wednesday, June 25, at 8:00 P. M.

After a solo by Mrs. F. G. Shepard, Dr. J. H. Kellogg addressed the convention:

THE GERM THEORY OF DISEASE AND ITS BEARINGS ON MODERN LIFE.

(Illustrated by means of a Stereopticon.)

BY J. H. KELLOGG, M. D., MEMBER STATE BOARD OF HEALTH, BATTLE CREEK.

(Reporter's Abstract.)

Sometime ago a Sunday school teacher asked a little girl what was meant by the "fowls of the air," referred to in a certain text. The little girl thought a moment, and said, "Please, teacher, I think it must mean bad smells." Now, the committee on arrangements have asked me to talk to you tonight about germs. These germs, I think, may very properly be considered as "fouls of the air," fouls of the water and of the earth. They are found to be everywhere. Twenty-five years ago, if anybody were to have said anything about "germs," he would have been thought to be insane. I am not going to tell you tonight *all* about germs. The subject is too large, and it would be impossible to cover it in so short a space of time as one evening.

Technically these germs are known as microbes. That is the scientific name for these organisms. They impress themselves upon the mind as being monstrous creatures. Indeed, I have often heard them spoken of and by intelligent people, as "creatures." The germs are not creatures. They are plants, belonging to an order closely allied to the fungi. They require the same conditions for growth as other plants; warmth, moisture and food. One of the most peculiar features of these organisms is, they are so very small, that they cannot be seen by the naked eye; consequently the only way by which we can examine them is by means of a powerful microscope. They are found to explain many wonderful phenomena, to some of which I will call your attention, tonight. Many things which were formerly considered mysterious, are now perfectly clear. Germs are simply vegetables. They develop and produce various results. They are exceedingly minute, some of them even being so small that it would require twenty thousand of them ranged in a row to make a line an inch long. They are also of different forms. Some of them are dot-shaped and are called micrococci; some are shaped like a rod and are called

bacilli, while some are spiral or cork-screw shaped, the spirilla. Most of them can be brought into one of these classes.

Now, let us consider some of the properties of these curious plants. The rapidity of growth is one thing that attracts our attention. These little organisms produce spores, just as other plants produce seeds. These grow so rapidly that in some instances one germ can become two within the short space of fifteen minutes. Now, perhaps some of you will take the trouble to make the mathematical calculation as to the number of germs that can be produced in twenty-four hours, at that rate. It might also be interesting to figure out how much space of the earth those germs would occupy. This might be done by figuring from the space that one germ covers, which is about one twenty-thousandth of an inch. You have no doubt all heard of the red snow that is sometimes said to be seen in the Arctic regions, where, for miles the snow is covered with something resembling blood. What makes it? Simply a certain species of germ. Well, we see that these germs will multiply so rapidly so as to spread over a large space of ground in a few hours.

Now, germs require food. They could not grow without food, any more than corn planted on a rock could grow without food. So, of course, when the food in the vicinity, is all eaten up, the germs will not grow. As soon as the germs find out that the surroundings are not favorable, they will not further develop there. So, too, they rely on the temperature for development,—they must have a favorable temperature. Then another reason why germs do not grow to such enormous numbers as they seem to have capacity for growing, is, that germs in the process of growth, produce certain poisonous substances, and these poisonous substances are poisonous to the germs. These poisons are known as ptomaines. "Ptomaine" is a word as seldom heard now-a-days as the words "Germs" "Bacilli" or "Bacteria" were fifteen or twenty years ago. But I dare say that in the next ten years, the word "Ptomaine" will become a familiar term, that it will become a household word, as "germ" is now. These ptomaines are the product of the action of germs.

Germs are useful in some ways; for instance, if it were not for germs, everything that dies on the face of the earth would remain there in the original condition. If a dead animal were not subjected to the action of germs, it would always remain on the face of the earth; and that, you know would not be at all pleasant. Just as soon as an animal dies, germs begin their work upon the carcass, and in a short time reduce it to dust. So, in this, we find them useful. Then again we find the matter which constitutes the active usefulness of the soil, being used over and over again. Of course we all know that the soil on the surface of the earth extends to but a small depth,—in some places a few inches, and in other places several feet. Now, if living things absorbed this useful matter and it was not returned in its earthy form, in the course of a few centuries all the active material of earth, useful for producing living forms would be used up and we would have no animal life. Some germs, therefore, are exceedingly useful, and in some things they are absolutely necessary, while some are very dangerous.

In the decomposition of these organic structures, animals and vegetables, some germs produce exceedingly poisonous substances. By way of illustration, there is a certain germ that decomposes sugar. Now, when the sugar has been decomposed, we have two poisons; carbonic acid gas is one poison,

and alcohol is another. For alcohol when taken in sufficiently large doses, is poisonous.

Some years ago it was found that a poison existed in a certain cheese, and a great number of persons were made sick by eating it; and at the request of the State Board of Health, Dr. Vaughan of Ann Arbor, by a careful chemical analysis, discovered this poison and called it tyrotoxicon.

Very much might be said on the subject of the development of germs and on the wonderful vitality of which they are possessed. Some of them can resist heat and cold to an extent that is marvelous. Germs are found up at the North Pole, or as near to it as we have been able to approach. Some can resist a temperature of seventy degrees below zero. It requires a temperature of three hundred degrees to kill all germs, or at least to kill their spores. A boiling heat will destroy most germs. Alternation of heat and cold will kill germs; the yellow fever and typhoid germs are killed in that way.

Let us now consider some of the effects of these germs on the human body. Now, it is only when we take the body in pieces and examine it, with the microscope, and look into its minute structures, that we can really know what it is. By studying the various organisms, we find what the germs have to do with them.

How are we protected from the action of the germs, while living? They cannot get through the skin, and they cannot get through the mucous membrane, under ordinary circumstances. But if the skin is abraded, the germ can quickly gain an entrance. If there is an abrasion of the stomach or of the intestines, the germs can get in. In a number of conditions, germs can get into the interior of the body. They are about us all the while. The question is, why do they not destroy us,—those that are harmful? It is because the body has the power to resist them. In the first place we are protected from them; and in the next place, if they once get inside the body, we have various structures that resist the germs, and which are all the time contending against them; when they get into the blood, the white blood corpuscles at once surround them,—swallow them. That is what these white blood corpuscles are for. That fact explains why we do not have some diseases twice. These germs are digested by the corpuscles, and they become used to them, and the body is thus fortified against a second attack of the same disease. People do not generally have small-pox more than once. When the germs of a certain kind get into the blood in too large quantities, so that the blood corpuscles are unable to digest all of them, then it is that we have the disease conveyed by that particular germ. There are various ways in which the germs operate. One way is that they get into the body and develop a dangerous poison there, in consequence of which we become sick.

There are a great number of diseases which are produced by germs. For instance cholera is one, a most dangerous disease, which is produced by germs getting into the drinking water, by which means they are taken into the system. Then there are the typhoid fever germs. It is said by some that there are quite a good many different kinds of germs that will produce typhoid fever; but it is generally thought that there is but one particular kind that will produce it. Then, diphtheria is probably a germ disease. In fact, I think this has been clearly settled beyond doubt. There are also scarlet fever and small-pox, both contagious diseases, and both germ diseases. There are a large number of diseases that the germs produce, and especially at this season of the year (June). A great many

diseases are due to drinking water. The surface water always contains a vast multitude of germs. Twenty-five or thirty different kinds of germs have been found in milk. One germ has been found which when added to fresh, sweet milk, will sour it. Another kind of germ will curdle it, without souring it; another germ will make it bitter. One kind of germ will produce an odor of violets, another a nauseating odor. Germs generally, produce unpleasant odors. You know there is such a thing as blue milk. Some of you no doubt have seen milk that had a reddish tint. Well, these colors are due to an extensive growth of certain kinds of germs. If the milk is kept warm, germs grow very rapidly. If the milk is quickly cooled, then the cold has an effect to delay the growth of the germs.

Now, let us consider briefly where germs come from. In the first place, some kinds are constantly in the air. The air at sea is free from germs, unless, of course, they are carried there; but the sea air is comparatively free from germs. Ordinary land air is swarming with them. They are in the house, and around the house, down cellar, up stairs, and all over. Dust is chiefly made up of germs. These are the germs of ordinary decomposition. Then there are germs of diphtheria. There are germs of scarlet fever, typhoid fever and consumption. Germs rise from the sputa of the consumptive, expectorated along the street, and in other places; the sputa becomes dry, and the germs are taken up by the air and inhaled into the lungs. Many localities once celebrated for the absence of consumption, as for instance California a few years ago, on being much frequented by consumptives became infected with the germs of the disease, and are now no less dangerous than any other place.

Now, what must we do to be saved from germs? We must keep the dangerous germs away, and keep away from the germs. All persons sick with dangerous germ diseases, such as small-pox, scarlet-fever and diphtheria, should be isolated, so that the germs may not be spread about and infect other persons. Then, after death or recovery of such patients, all infected substances should be disinfected. Disinfection means the destruction of the germs of disease. There is one other precaution that I wish to call your attention to, and which should not be overlooked, and that is to boil the drinking water. In no other way is it safe to use water that is not absolutely pure. If this is done, a great many cases of typhoid fever will be prevented.

Dr. Kellogg then exhibited on canvas, by means of a stereopticon, the germs of different diseases, and cultures of germs on the potato, and on gelatine, explaining each to the audience.

Third Session, Thursday June 26 at 10 A. M.

Judge Benjamin F. Graves, President of the Convention, after calling the Convention to order, spoke substantially as follows:

REMARKS BY JUDGE BENJAMIN F. GRAVES.

When the convention adjourned last evening, the subject under discussion was the Germ Theory of Disease, and its bearings on modern life; and it was so late that no discussion was had. I now desire to provoke some further discussion of that subject. For nearly fifty years I have been,

myself, a believer in what may be called the germ theory of disease; but after all, this was with me, as you may well imagine, more a matter of faith than a matter of reason. So far as my mind was directed to the subject, it was rather in the way of a swim in the ocean of conjecture than anything else; but during the last few years, so far as I have been able to think upon the subject, my original opinion has been confirmed. But there may possibly be some danger, when you reflect upon this subject, (and I am only making a few suggestions for the purpose of provoking discussion of it.) I say there is possibly some danger of misapprehension, unless we have some further discussion of the subject. Now, it would be possible for hasty thinkers to conclude after hearing what has been said, that all germs as a general thing, would be dangerous, would be prone to mischief, might be fatal to us, and to conclude that the immense mass of germs ought to have been absolutely exterminated a long time ago. Well, now, in one view it might be possible to put that sort of a construction upon this subject, and it might lead us to very absurd results. But as I understand it, that is not the construction which our learned friends have in mind at all.

My only object, recollect, is to provoke discussion, but my understanding is that a great multitude of these germs are perfectly friendly to us under almost all circumstances. They are needed. They are proper things to be, they do us no harm at all, yet there are some germs that under some conditions, are not only dangerous but most fatal. But even then we have to consider the conditions of the individual and the nature of these germs, and the manner in which we become exposed to them. Now, on some occasions an individual may be exposed to the germ of scarlet fever, or small-pox, and suffer no injury. He may be exposed under given conditions, to the germ of diphtheria, and suffer no injury, and so on through the whole category, and yet under other circumstances and other conditions, this exposure may produce a fatal disease. Now, I think it is a matter of general observation, that some of these diseases may prevail in and around the neighborhood some seasons, in a mild type, and people think that such is a good time to have the disease, that it is less dangerous or less verulent than it is at some other time. Now, all this is to me, as a matter of course, ambiguous, but it is a subject upon which our learned friends are able to enlighten us. As I said at the beginning, my only purpose is to invite discussion on this whole subject. If you please, I would ask Prof. Clark to make a few remarks.

REMARKS BY A. ARNOLD CLARK.

It is true, as the President has stated, that not all germs are dangerous to man, and this should be generally understood. Not all plants are poisonous and not all germs are disease-producing. It is a germ which turns milk sour. That might be called, figuratively, a diseased condition of milk, but it is not dangerous to men. So it is another kind of germ which turns milk blue and another kind which turns it red. The beautiful light seen at night from certain kinds of wood is the work of germs. Indeed the process of nitrification going on in the soil and producing nitrates, without which there would be no plants, no agriculture—all this is the work of a germ. So many germs are our friends. It is a germ which turns sweet meat into carrion, a germ which makes our teeth decay. The bad taste in the mouth in the morning is a fermentation set up during the night by the germs in our mouths. It is a germ which makes us bald.

Indeed it is all a myth about baldness being the result of domestic fireworks. Mildew is the work of a germ. So we can make disease germs grow on glass plates and in bottles as mildew grows on linen. It is a germ which makes fruit ferment. When you can fruit, you boil it to kill the germs of fermentation, and then you can it up tight to shut out the germs of fermentation in the air. It is a germ which turns grape juice into wine. It is an entirely different looking germ from those which cause disease and yet it works in much the same way. Indeed the process by which one becomes sick and the process by which one becomes drunk are largely the same. When the little yeast plant enters the grape juice it has the wonderful faculty of breaking up the sugar into two substances entirely different,—carbonic acid gas which escapes and alcohol which emains. So when the germs of disease enter our bodies they break up our body compounds into poisonous ptomaines, each germ producing its own ptomaine and each ptomaine producing the symptons of that peculiar disease just as the germs of fermentation make the alcohol and the alcohol produces the symptoms of drunkenness.

While it is thus true that many of these germs are friendly to man, by far the most important to us are those concerned in producing disease. About 90 of these germs are concerned in producing disease; about 50 of them cause diseases in man. We are not certain when we drink the sparkling water and breathe the invigorating air that we may not be drinking the germs of typhoid fever and breathing the germs of consumption, diphtheria or scarlet fever. More dangerous than foreign foes are these little germs which linger about our hair and clothing, cling to our carpets and our walls, find a hiding place in the garret or the cellar—still just as dangerous many months after they emanated from the body of the infected person.

The speaker then gave an account of Koch's discovery of the bacillus of consumption, and of later experiments by Dr. Cornet with the germ-laden dust from the walls of rooms inhabitated by consumptives, and strongly recommended the disinfection of all sputa from consumptives.

As an illustration of the care and thoroughness of sanitarians in their scientific researches, the speaker then gave an account of the experiments which had recently been made which seemed to prove that the Löffler bacillus was the cause of diphtheria, and yet sanitarians were waiting for more experiments. In closing, he urged the importance of destroying these germs which cause disease, and stated that, according to the statistics, one person in every 30 who were present would be destroyed by the germs of typhoid fever, one in every seven by the germs of consumption, while one in every three present that morning would yield his life to some germ disease which might be prevented.

THE BEST METHODS OF SEWERAGE IN BATTLE CREEK.

BY W. W. BRIGDEN, C. E., BATTLE CREEK.

There are orators of ability here who can entertain you, but you can expect nothing of the kind from me, and I shall only endeavor to give roughly the ideas of a civil engineer, in regard to "The Best Methods of Sewerage for Battle Creek."

Some kind of sanitary science has been known and practiced in nearly all ages but the modern form of sewerage in a large portion of the streets or

alleys of cities is a growth of the nineteenth century. Previous to this century it was not considered proper to even so much as speak of such matters in polite society and no gentleman would engage in the planning or construction of anything pertaining to so vile a subject. Everything was left to scavengers or those of similar callings, who were ready to undertake anything no matter how foul. Some rough sewers and drains had been constructed in the city of London, England; but as there was little intelligent planning or supervision the sewers were crooked, rough and without much attempt at proper grades; so that they nearly all gradually filled up. When they would no longer pass anything, men were sent into them to clean them out by hand. The large sewers were not so difficult to clean but when the size did not exceed two feet, the work was not only very filthy, but very laborious. The author once crawled up a nearly clean two foot sewer for ten or fifteen feet, but soon backed out in great haste, with no relish for another trial. Many persons looking at the mouth of a large sewer and seeing the large volume of liquid filth pour forth, would not be tempted to enter for a large sum; but when no flood is passing through the sewer, and with the man-hole covers off, at the nearest points, the author has several times passed hours in sewers from three to four and a half feet in diameter. After being inside for a few minutes no notice is taken of the stench that outside appeared so formidable. Nearly every engineer who has any experience, would no doubt recommend a beginner to enter the large sewers and see them in actual use; for no where can one get so clear an idea of their defects or understand the thousand ways in which their proper working can be interfered with, even where properly constructed.

There are two so called systems of sewerage in use in this country viz: the combined system which is used in nearly all the large cities and which provides in one sewer for the carriage of not only the sewage proper, but also a portion or the whole of the rain fall. The other system is called the separate or small pipe system, and provides small sewers for the sewage proper and takes none, or at least very little rain fall into them. It is also intended to rigidly exclude all ground water in the separate system; but this is only a partial success as it is very difficult to make sewers water tight. It is also provided that the rainfall shall be removed by flowing over the surface; or that a separate set of large drains laid at shallow depths shall be used to remove surface drainage.

The separate system was first introduced in this country in 1880 by Col. Waring, a well-known sanitary engineer, who advocated entire exclusion of rainfall—shallow depths—ventilation through house drains—man-holes not oftener than 1,000 feet apart and six inch pipe for nearly all the branch sewers. The yellow fever stricken city of Memphis, so deeply in debt as to give up its charter, needed sewerage badly, but could see no way to enable it to meet the cost. Col. Waring then succeeded in convincing the proper authorities that his system would answer the purpose, and the contract was let for its construction. For some time the Memphis sewers were praised very highly, but within a few years some severe criticisms have been made. In a summary of a late report of the superintendent of sewers to the city engineer the following is taken from the Engineering News:

"1. That the laterals and mains are of insufficient size. There are stated to be over two stoppages of flow per week in the six inch laterals, and nearly 40 per week in the four inch house drains. Many of the mains are said to be overcharged by the ordinary service of the sewers. He recommends for

the new district a minimum size of eight inches for the public sewers, and six inches for the house-connecting branches, extended to the sides of the street or alley.

"2. That all changes of line, both vertical and horizontal, should be made in man-holes.

"3. That the depths of the sewers in many places have proved wholly inadequate, and

"4. That man-holes for purposes of inspection and cleaning should be built at every street intersection, *i. e.*, about 380 ft. apart."

The present practice is to lay larger pipe and generally to draw nearer to the work of the best engineers in England. Which of these methods shall be adopted here has not yet been even discussed; and to many it is not known that there is more than one system. Should the common council direct the Board of Public Works to prepare plans and estimates, as is now contemplated, no doubt discussion would begin at once and as usual some will form strong opinions which they will not be slow to defend.

In favor of the combined or large pipe system it may be said that very few if any large cities have abandoned their construction and excluded the entire rainfall. The city of Omaha has tried both and has practically abandoned the small pipe system. As the engineers of these cities have great experience their practice in this respect is not at all favorable to the small pipe system. Among the reasons for not changing are that custom has made it difficult; the speedy removal of rainfall from the streets and yards is very satisfactory in all places, especially on steep slopes and very flat ground; rainfall can be taken direct from the roofs to the sewers and there is less danger of sudden complete stoppage. In the author's practice he has never known a sewer of over 15 inches diameter to be stopped up completely, but it is not at all a rare occurrence for 12 inch sewers (which are ordinarily the smallest mains used in the combined system) to become entirely choked up and have to be taken up, or cleaned by scoops and disks drawn through the sewers by chains. One city, Chicago, cleans large and small sewers in this way but Chicago is a rare exception in this respect; not having enough difference of elevation to give its sewers ordinary grades. The highest point inside the late city limits is about 26 feet above Lake Michigan and the larger part has but half that elevation.

The modern practice uses two egg-shaped sewers for sizes above 24 inches in diameter which concentrates the flow of the sewer during dry weather in the narrow bottom of the sewer, thus securing nearly all the advantages of the small pipe or Waring system, as far as dry weather flow is concerned.

In favor of the small-pipe system is the cleanliness, nearly uniform flow, the use of sewer pipes instead of bricks for the principal mains, automatic flushing of dead-ends, and above all the great length of mains than can be laid as a starter in a city putting in its first sewers. In the author's opinion this is the great prime mover that induces so many cities to adopt the small pipe system, especially the Waring variety. Many no doubt look upon the small pipe system as a great and unquestioned improvement on any formerly known practice. This is not entirely true for English engineers have for many years used smaller pipes than we, and excluded at least a part of the rainfall. Their practice is the result of much larger and greater experience than ours; and some of the best engineers of this country are falling into the same line. This English practice is outlined in the books of Baldwin Latham and Sir James Rawlinson, two of England's

best sanitary engineers; and these works are standard authorities for most engineers in the United States—more so I think than any American book.

You have no doubt arrived at the conclusion by this time that the author is an advocate of the combined or large pipe system of sewerage for Battle Creek, but such is not the case. A sound conclusion will only be arrived at after much time has been devoted to the subject. That the original outlay will largely influence the city in its decision I am quite sure. Even should we discard the extreme practice of Col. Waring and his followers, and excluding rainfall, lay our sewers at an average depth of eight or nine feet; place man-holes every 300 feet instead of 1,000 or more, and lay eight-inch pipe for the smallest main, still the difference in cost per foot would be at least three or four to one as compared with a system of sufficient size to carry off one-half inch of rainfall in an hour, and no doubt the decision will be, as in most cities about to construct sewers, that, if not the best, still the small pipe system is the most feasible for us, and we will adopt it for our city. Should this be the result, the system should be based on the following recommendations of the well known sanitary engineer, Rudolph Hering of New York:

"1. Exclusion of rainwater as far as practicable, even every drop of roof and surface water where this can be accomplished.

"2. Sewer pipes laid perfectly straight in line and grade between points of access, to allow of complete inspection.

"3. Man-holes or lamp-holes at every change of line or grade, which change is made by a smoothly curved channel within such holes.

"4. Size of sewers proportioned to carry not less than three times, better six times, the average daily water-supply. Size of public sewers to be at least nine inches diameter.

"5. Flushing channels at heads of sewers and drains. Automatic syphon or other appliances.

"6. Ventilation through perforated man-hole covers, at least once every hundred yards."

Had Memphis, Kalamazoo, San Diego and other places followed this practice they would not now be so near the full capacity of some of their sewers.

Now a word in regard to the location of sewers in a system for Battle Creek. The city charter does not specifically require that main or trunk sewer outlets shall be located so as to avoid putting sewage into either the Kalamazoo river or Battle Creek above their junction; but it seems to intimate that this is expected; as it certainly should be. No sewer should enter *above* the junction and any plan built at present should provide for the future continuation of one or more trunk sewers down along the Kalamazoo river, at least to the present city limits. At *present*, however, a few temporary outlets may be placed at convenient points below the confluence of the two streams. Above the junction the Kalamazoo river often has a very small flow, and the current in Battle Creek is very sluggish; but below that point the flow is good.

A trunk sewer should run west on Main street with the plan providing for its being ultimately carried down Carlyle street and across the river to Hamblin Ave., and thence west along Hamblin Ave. to Angell street, or further if desired. This sewer would have sub-mains leading along Bennett street and South Ave., and would provide sewerage for all the territory between the Kalamazoo river and Battle Creek except that near

the stream levels. This latter territory can only be drained by risking the uncertainty of high water, or by pumping to a higher level.

On the north side of the Kalamazoo river and Battle Creek a trunk sewer will be required in Kalamazoo street from Angell street to Cass, north on Cass to Main street, east on Main to Gould street, north on Gould to Van Buren street, east on Van Buren to West street, north on West to Champion street, east on Champion to North Ave., southeast on Adams street to Maple street, and east on Maple as far as desired. This sewer should have a sub-main in Calhoun street, leaving the trunk sewer at West street, and continuing east to Merritt Ave., and then north on Merritt Ave. as far as wanted. This sewer district would provide for all the territory north of its line, except that along Burnham's brook, and also for a small portion on the south side. The length could be much shortened by making a temporary outlet at some point at or below the junction of the two streams.

A third trunk sewer should be placed in Upton Ave. and can have its outlet at Angell street or farther west. It should have a large branch up Lake Ave., and will drain all the territory south of Upton Ave. and Lydia street as far east as Coldwater street.

For the district between Upton Ave. and the Kalamazoo river the trunk sewer should lie in Hamblin Ave. and may require special treatment either by flop valves to keep out high water or by pumping.

To return to the merits of the separate system of sewerage as compared with the combined system,—there are some excellent sanitary engineers who hold that this question should be decided for each individual case by itself. This seems a proper manner of treating the question and while there are points in favor of the separate system for Battle Creek such as the good natural drainage, yet on the other hand no one can doubt the financial ability of Battle Creek to meet the expense of the costlier method.

As we have ample capacity in the river to remove all sewerage it will not, of course, require artificial treatment.

The great need of sewerage in Battle Creek cannot be denied.

This subject should have been treated more definitely in this paper, but as no official action has been had in the matter I have given it little or no attention, until after being notified that the subject had been assigned to me.

Thanking you for your courtesy I will leave the discussion to the able gentlemen present; but shall be glad to answer any questions that may be asked.

THE SEWERAGE AND DRAINAGE OF BATTLE CREEK.

DISCUSSION BY PROF. A. ARNOLD CLARK, LANSING, MICH.

I understand that Battle Creek is a city of fifteen thousand inhabitants, and constantly growing larger and larger, and as a result whatever improper conditions there may be in your city, are daily growing more and more dangerous. A little village may get along for a time without any special system for the disposal of its waste, but as it becomes more thickly populated, as its soil becomes saturated with wells and vaults, its death-rate naturally begins to increase. The only way a city can keep down its death rate as it becomes larger, is to meet the new obligations imposed upon it as a city. You must give up your right to maintain privies, cespools and vaults, you must expect to pay higher taxes; all in return for greater protection. A public water-supply and a sewerage system for the disposal of its waste seem to me just as much the business of a city of this size as the lighting of its streets.

I am informed that the water-supply of Battle Creek stretches over 13 miles of water mains and yet there are large numbers of people who depend upon wells, and so long as this is the case the five thousand vaults of Battle Creek liable to receive the dejections of some typhoid patient and carry the germs to some neighboring well, these five thousand vaults are just so many relics of barbarism; there can be no doubt about it. Hundreds of cases are on record where the germs of typhoid fever thus finding their way to some vault have been carried under ground long distances only to make their appearance in some neighboring well. If you are drinking water from a well situated thirty or forty feet, or fifty or sixty feet from a neighbor's vault, you may be tolerably sure what you are drinking. You know Artemus Ward used to say that when he went to a hotel he always ordered hash—then he knew what he was getting. Still, you say you have been drinking bad water all your life, and you never yet died of typhoid fever. This may be true. You may drink water from a well located only a few feet or rods from a neighbor's vault, and every time you drink from the well you may drain the vault, and you may keep this up for fifty years if you enjoy that sort of thing, and never get typhoid fever because the specific germ has never found its way into that vault, but the magazine is ready for the spark. Some day the germs of typhoid fever may find their way into that vault, and then you will drink not only filthy water, but the germs of typhoid fever as well.

Hence I say that the vaults of your city are nuisances and should be abolished. What shall take their place?

Infinitely better than the vault is the dry-earth closet system—a system in operation in Birmingham, England—a city of 500,000 people and in other cities, but it costs a good deal to cart the dirt to and from a large city (at least one-half ton per year per each individual being required) and unless it is managed by the whole people it may be neglected, but as a temporary expedient I think it will have the unanimous recommendation of those in attendance at this convention. You should adopt the dry-earth closet until a sewerage system is in operation. Indeed your local board of health has it in its power to abolish the vaults of this city as nuisances and substitute dry-earth closets in their place.

But I think there can be no doubt that Battle Creek is now

READY FOR THE ADOPTION OF A SEWERAGE SYSTEM

and it is only by the adoption of such a system that you can keep down your death-rate and make Battle Creek a healthy city to live in. Mr. Chadwick used to say that he could construct a city with any desired death-rate, just in proportion to the amount of money which he would expend on public works. It is certainly true that we can construct a city with any desired death-rate from typhoid fever. We can construct a city where 25 persons or only one person to every 10,000 inhabitants will die each year from this disease. And the question for you to settle in Battle Creek is what kind of a city you wish to construct, whether you wish the people who talk of moving here to know that this is a city where only one citizen, or 25 die each year from typhoid fever.

It is also true that in a given city, after an examination of its water-supply, its sewerage system and a study of other conditions we can predict about how many persons in that city will die each year from typhoid fever.

In the lower part of the diagram before you there is an illustration of the number of deaths from typhoid fever in Munich during a long series of years.* The first line represents the average annual number of deaths between 1854 and 1859 when Munich was absolutely without any system for the disposal of its waste. The privies at that time were said to "extend like huge chimney shafts from the tops of the houses with openings on every floor down in the cellars where they end without any sewer-connection or water-flushing."

The wells became so contaminated from leachings from vaults that strangers were warned not to use them and every year in the city of Munich 24 persons in every ten thousand died from typhoid fever.

In 1859 owners were requested to cement the vaults and to clean them out at intervals, and during the next five years seven deaths in every ten thousand inhabitants were prevented each year from typhoid fever.

In 1866 sewerage works were begun and there was a fall in the death rate. In 1874–80, the works were continued with a corresponding fall in the death-rate; while today in the city of Munich, not 24, but less than two persons in every ten thousand inhabitants die each year from typhoid fever, though Munich has been growing all this time and is more closely packed now than in 1859.

Munich during these years has had an average population of 235,000. Now comparing the two periods, this means an annual saving of over 23 lives in every ten thousand for the whole city—an annual saving of over 500 lives by the introduction of sewerage.

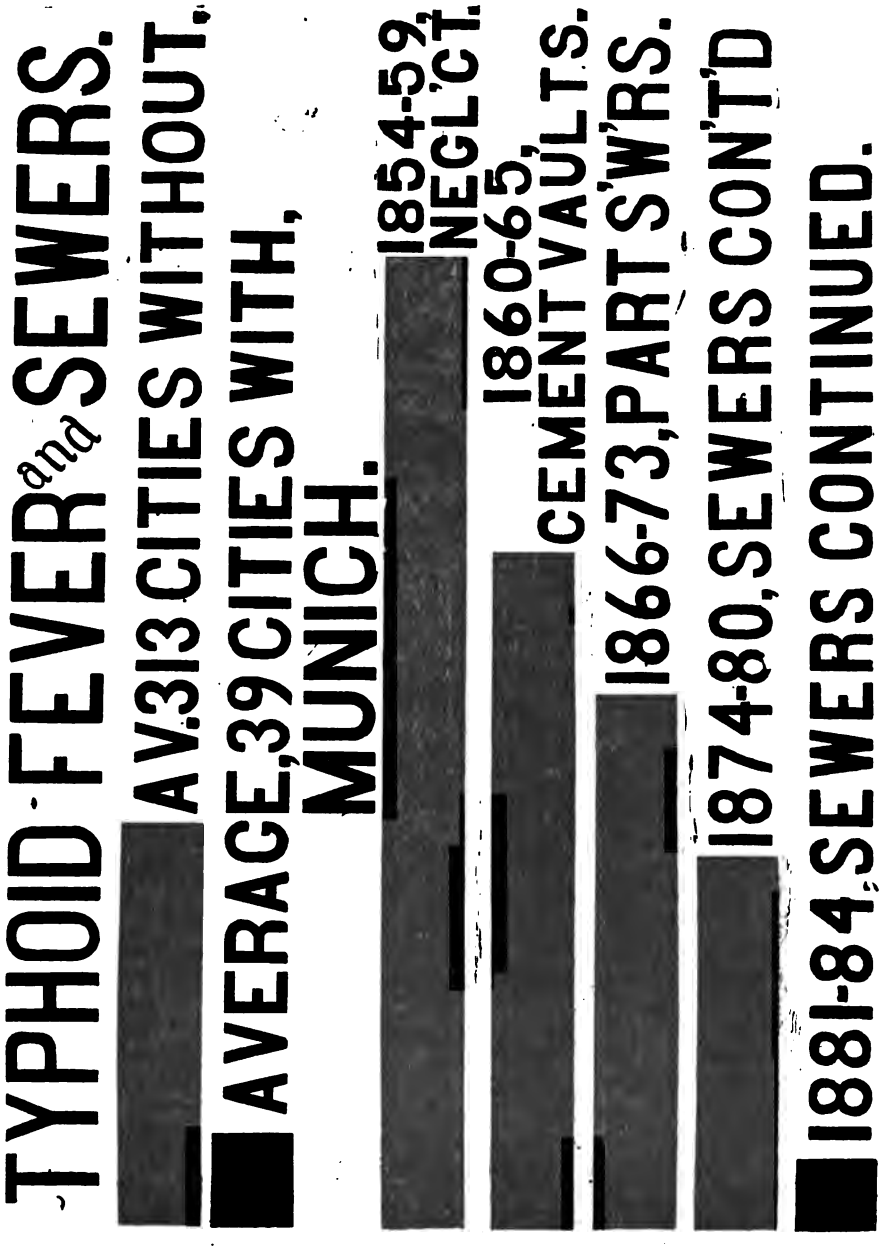
More than this, for Soyka has made a careful and critical study of the typhoid deaths in Munich since the introduction of sewerage and he has shown that, when typhoid does occur, it is the unsewered districts which always suffer.

In the upper part of this diagram, you will see the upper line representing the annual average number of deaths, for a series of years, in a certain number of cities of Europe and America without sewers; and in the lower line the average annual deaths in cities with sewers, showing that this is true the world over for the same series of years,—that in the unsewered cities there are each year over

* The diagram, reduced in size, is on page 39.

FOUR TIMES AS MANY DEATHS FROM TYPHOID FEVER AS IN THE SEWERED CITIES.

I might mention a score of cities which have had a similar experience to Munich. The history of Berlin would make a similar diagram. The typhoid death-rate is still some higher in Berlin, but this is in the unsewered districts, for, as Durand Clayé from a careful study has shown, there are



five times as many houses having typhoid fever in the unsewered as in the sewered districts of Berlin. The same facts are observed in Breslan, Dantzig, Frankfort, Hamburg and other cities. Immediately after the introduction of sewerage there is a sudden fall in the death-rate from typhoid fever. [Facts on this subject are shown in the diagram "Chart I." on page 10.]

The typhoid death-rate in London today is only one-fifth what it was before 1860 when the present sewerage system was introduced. New York and Brooklyn have had an abundant water-supply and splendid sewerage system for many years and the typhoid death-rate is very low. Compare this death-rate with the death-rate from typhoid fever in Cincinnati, Baltimore, above all with Toulon and Marseilles in France where typhoid rages the year round and cholera never passes by.

Durand Clayé shows that in Paris those localities which suffered most from cholera were the same localities which previously had suffered most from typhoid fever, and it is a general truth that when cholera appears in a country it strikes the same cities, the same wards and the same houses where it has been before—that is, the unsewered cities, the unsewered wards and the unsewered houses.

Now let us apply these general conclusions to Battle Creek. During the three years, 1886–1888, 19 deaths from typhoid fever (including typho-malarial fever) were reported from this city to the office of Secretary of State.* Owing to incompleteness of reports, it is supposed that only about one-half of all deaths are reported. That would make 38 deaths during the three years or 12 or 13 deaths a year from

TYPHOID FEVER IN YOUR CITY,

which is perhaps a slightly higher mortality than the average throughout the State. Now, if you had as good a water-supply and sewerage system as they have in Munich you might expect only three instead of 12 or 13 deaths a year from this disease. You could certainly make the rate as low as this, for Munich is 20 times as large as Battle Creek and much more thickly crowded. I believe it is only by the adoption of such a system as this that you can make Battle Creek a safe and attractive place to live in.

It is not necessary for me to enter into the details of a system of sewers for your city. I agree with the essayist in favoring the separate system,—that is, small sewers for the removal of the sewage, and other drains for the removal of the storm water. The author of the paper has told you how the sewers of the combined system were made big enough to accommodate both the sewage and the storm water. You remember Victor Hugo's description of the sewers of Paris which were so large that Jean Valjean was able to pass through them upright with Marius on his back. The sewers of Rome were large enough for the Roman emperor to row a boat through them. Now there is this objection to these large sewers: It being necessary to accomodate the heaviest rainfall, in dry times the sewage flowing over so large a surface flows very slowly. This furnishes a good opportunity for the formation of sewer gas, and sometimes this sewer gas goes the wrong way. As Victor Hugo said: "This stomach of civilization frequently digested badly and the sewer flowed back into the throat of the city."

*In 1886, 7 deaths; 1887, 4; 1888, 8.

The damp walls of these drains became a good nest for the microscopic germs of disease which also flowed back into the houses with the sewer gas. It seems to me that a great step was taken in sanitary progress when ten years ago Col. Waring recommended to the citizens of Memphis, the adoption of what has since come to be known as the separate system of sewerage. This system had previously been introduced in England, in a modified orm as the writer has told you, and its object is to remove by the sewersno thing but the sewage and to remove the storm water by other drains or to trust to natural drainage.

The citizens of Memphis were taught the necessity of a proper sewerage system by a great epidemic of yellow fever which cost that city in ten weeks five thousand lives. But that epidemic was just what the citizens of Memphis needed. Memphis was one of the dirtiest cities on the globe. At once the people of Memphis cleaned out their five thousand cess-pools, put in these small sewers recommended by Col. Waring,—ranging in size from six to 15 inches (with a main outlet sewer of 20 inches), with automatic flushing tanks filled every twenty-four hours and then discharging 150 gallons in less than a minute, with ventilating pipes running to the tops of the houses. While stoppages have occurred in the six-inch sewers, there have been none in the eight-inch sewers. The sewers run so nearly full that there is no chance for germs to grow on the walls or for sewer gas to form, the whole underground network moves with regularity of clockwork, and since the introduction of this system the death-rate in Memphis has fallen off one-fifth.

You would naturally sewer into the Kalamazoo river. About the only danger in doing this would be to the town of Plainwell, 35 miles from you, which is, I believe, the only locality taking its water-supply directly from that river, and this is something which no town should do. So, you have the proper conditions and a sufficient fall for the introduction of a splendid sewerage system.

Let us assume that the cost of such a system would be $6,000 per mile. Can you afford it? Can you afford it at once? It seems to me that the question might be put in another form, this way: Can your business people afford to have Battle Creek get the reputation of being an unhealthy city with a high death-rate? Then, too, would it not be

CHEAPER TO SPEND THE MONEY ON PUBLIC WORKS

than to spend it afterwards on sickness? For there is no doubt about it; to have sickness in a community is to have a financial panic. Suppose there are only ten deaths each year from typhoid fever in Battle Creek. Those ten deaths will be of persons in the prime of life. If those ten persons had been slaves in the slave markets of the south they would have been valued at $1,000 each. It is safe to say that they are worth as much to your community. If one of them were injured in a railroad disaster it is safe to say that the relatives could collect from $1,000 to $5,000 as the money value of that life. Now I know it sounds almost like sacrilege to talk in this Gradgrind kind of way about the value of a human life. But it is a fact, whether we consider man as the law considers him, whether we sit down with a life table in our hands, as did William Farr, and calculate the future annual earnings of a man at a given age, then subtract his future cost of living, and take the capitalized remainder as the value of the man to the community, whether we say, as some have said, that each man is

worth to the community, just what it will take to reproduce, to train up from infancy, another man just like him, or whether we remember in a simple, common sense sort of a way, that in the slave markets of the south the average value of a man was $1,000,—however we consider it, every man who is not sick or a vagrant, will give the world more than he will take from it. No man ever yet lived and labored but the world was richer because he lived and labored; and, in an ideal community where all are employed, every life is a money blessing to the world. Every death tends to bankrupt the nation.

There is no exaggeration in saying that these ten lives destroyed each year in Battle Creek by typhoid fever have a money value to this community of ten to twenty thousand dollars. But for every person who dies from typhoid fever ten are sick at least thirty days each—three thousand days lost each year. Think of the cost of medical attendance, of nurses, and loss of wages, and figure out for yourself what a financial panic it is to have typhoid fever in your midst!

The loss can not possibly be placed at less than $20,000 each year—or in five years $100,000, and that would pay for your sewerage system.

Five years ago the city of Nashville, Tenn., spent over a million dollars on its sewerage and water-supply. Fifteen years ago Nashville had a death-rate of thirty-five in one thousand. Today the population has more than doubled, the people are much more closely crowded than they were fifteen years ago, and yet the death-rate is much less than half as high.

Battle Creek is liberal in providing for public works. The buildings and appliances belonging to the fire department cost $22,000. The annual expenses of that department are $5,000. Surely you will not hesitate to spend money to save life as well as to protect property in your thriving city.

Dr. John Avery, President of the State Board of Health, being called upon, said he did not think it necessary to discuss the necessity of sewerage with the intellegent people of Battle Creek; but the people often delayed putting in a system on account of the expense. He believed they could better afford to put in a system of sewerage than to stand the death-rate from typhoid fever. He agrees with engineer Brigden that the separate sewerage for this city would be the most practical and give the best results.

Dr. J. H. Kellogg followed Dr. Avery in the discussion of this subject. He said that after we have water-works, sewerage is necessary. We use more water now than ever before and consequently must have some means of carrying it off. If allowed to drain into the the earth it poisons our wells and breeds disease. Sewerage is not an expense, but an investmemt. A house provided with sewerage is worth more than one without, and consequently it is to the interest of everyone that we have sewerage from a financial standpoint if nothing else. Wells should all be dug below the sand rock. The poisonnus germs which filter through the earth do not penetrate so far into the ground.

Dr. Kellogg moved that the convention urge the city council to provide the city with a system of sewerage. The motion was supported and carried by the unanimous vote of the audience.

Fourth session, Thursday, June 26 at 2:30 P. M.

The afternoon session was opened with a solo by Dr. W. H. Ross of Grand Rapids, after which Dr. Baker moved that the discussion of the subject of School Hygiene be taken up, and that Dr. Green of Charlotte be requested to speak with reference thereto. Whereupon, Dr. Green spoke substantially as follows:

SCHOOL HYGIENE.

BY MRS. MARY E. GREEN, M. D., OF CHARLOTTE.

(Reporter's abstract.)

The subject of school hygiene is one in which I have been interested very much now for many years, not only as a mother, but as one who feels an interest in promoting the health of scholars generally. And I think that every mother, who has children in the public schools, takes an interest in this subject.

I regard physical exercise as of great importance in connection with the studies, and this involves the question of recesses. In many cases, the boys and girls are physically unable to do anything, after having gone to school for a few years. I have been in a position for observation in this regard for a number of years, and I believe that the lives of the children are materially affected in the majority of cases, by the confinement to study, and the absence of physical exercise during the day. Their brains are exercised, but the muscles are not. In many cases, regarding the recess, the school superintendents make their own rules and their own laws, regarding children, what they shall do, and no one is expected to interfere with them. If it is attempted to caution them regarding children and the childrens' demands, we are sometimes made to understand that they are capable of attending to the school and prefer no interference.

It has been my experience that school boards hire a superintendent whom they consider capable of attending to the enforcement of those rules, and the board seldom troubles itself about the rules and regulations of the school. Now, children are sometimes kept six hours out of the ten working hours, of every day, six hours at their studies, three in the morning and three in the afternoon session; during that time they have no recess. In many schools it becomes a penalty for a child to leave the room any time during the school sessions. In other schools, the superintendents have only one session of school; children come at eight o'clock in the morning and remain until one. During that time they have no recess and are obliged to remain the whole five hours in the room; and I would like to ask anyone before me here, how long he thinks he could sit at his desk and whether he could sit there five hours consecutively and do his work,

the ordinary mental work, without leaving the room. I believe there are very few men that could do that, and attend to their business correctly. I dare say they would break down under it.

I will not take your time longer than to offer some resolutions I have prepared, and which I will read to you:

"Believing that the best welfare of every community is in proportion to the interest manifested in the care and education of the youth,

"*Resolved:* That it be the expression of this body, that especial attention be paid to the temperature, light and ventilation of our school buildings. And further,

"Believing that recess is a necessity for the best physical development of our youth, we not only deprecate the no-recess plan on which many of our schools are conducted, but most emphatically protest against the one-session in schools, where pupils are kept for five hours in crowded, illy-ventilated rooms, under a severe mental strain, and debarred from any physical exercise.

"Therefore, be it resolved, that for the greatest prosperity and health of the future men and women, the public schools shall be under the surveillance of the local health officer, whose duty it shall be to visit the schools and recommend such hours of study and exercise, such methods of ventilation, such an arrangement of light, as to best develop and protect the brain, body and eyes of the pupils in our public schools."*

DISCUSSION OF SCHOOL HYGIENE.

Dr. J. H. Kellogg, member State Board of Health, Battle Creek:

I did not have the pleasure of hearing the entire paper, but it seems to me it is a question that ought to be discussed. I think I may say that the foundation for ill health, is often laid, in the bad conditions with which we are surrounded in early life. The resolutions refer particularly to the distribution and supply of light, to recess, and to proper exercise. These are all questions that ought to be considered. Also the placing of schools under the supervision of the health officer.

I can heartily support the resolution on these points. It seems to me, in the first place, that we ought to have our buildings properly constructed. We ought to have our school buildings constructed in such a manner, that it is not absolutely necessary for the children to go out of doors in order to get fresh air. We ought to have them abundantly supplied with fresh air, at all times. It certainly seems wholly improper for children to be compelled to leave the school room, and go out doors to get fresh air. For the recess exercise out doors is not very important if the air in the rooms is fresh and there is a sufficient supply; for a child is going to suffer in spite of the recess, if confined for an hour where there is no pure air, that being sufficiently long for the air of the ordinary school building to become extremely impure. Most of our school rooms are constructed in such a manner that within five minutes after the door has been closed, the air is absolutely unfit to be breathed. The plans of every new school building ought to be submitted to some proper sanitary authorities, the local officer of the board of health, or some one else, for examination with reference to the ventilation. They are too often constructed with a view towards economy.

* These resolutions were finally adopted. A part of the discussion follows the next paper—on Ventilation.

We often find men representing their furnaces, as the most economical furnaces to be sold, for the reason that they take the air from the room down through the furnace, and back into the room again. So, that it makes a circulation of air going round and round, and very often no fresh air is supplied. This is a matter of the greatest importance.

In regard to the no-recess plan, I am not quite certain whether I agree with the doctor or not. I do not know that I am thoroughly settled in my opinion on that question. There are several matters to be considered. I am inclined to think that one reason why the plan of no out-door recess has been adopted, is the moral welfare of the children. Parents often recognize the fact that children are in some way contaminated at school. Soon after they begin to go to school, they are not as good children as before, by reason of the influence surrounding them, and recess provides a means of contamination, it being a time when the children are not under the direct supervision of the teacher, when they are under little control, when they are all together, and under circumstances under which one bad boy can contaminate forty. In the winter time, boys go out into the snow and get their feet wet, and then come in and sit during the following session with wet feet; in view of these facts I often think that recess does more harm than good. Now, there ought to be intervals between classes. It seems to me that the scholars, especially small children should be under the control of the teacher from the time they come until they go home. I think it could be arranged to let the children have a regular recess, under the supervision of the teacher, who also should superintend their exercise in calisthenics, for instance, to be participated in at certain intervals during the day. I think that would be a very great advantage.

Dr. Green: I would like to say in reply to Dr. Kellogg that I could agree with him regarding the physical exercise. But I do not agree with him regarding the moral detriment to our children out of doors, exactly. Some years ago I was in Philidelphia; at their public schools, the children have recess all together; there are boys and there are girls all together, and I certainly know that Philadelphia stands as high morally, as any other place; the children were obliged to leave the room during the recess, and go into the school yard.

I am very much in favor of some exercise in the school room; and if the room is well ventilated, perhaps the recess out of doors is not necessary; but I certainly would not attach any penalty to a child having to leave the room at any time during the school hours; they should be allowed to leave the room as necessity requires. You perhaps will hear the superintendent say, "Well, they impose upon us." That may be. But it can be remedied when the teachers once find that the children are imposing upon them, in specific cases.

Now, one thing with regard to the atmosphere of the school room. I have heard complaints from mothers a good many times of the effects of the children taking cold and I thought I would go to the school room and ascertain what the trouble was. I found that the teacher occupied a position on the platform, and above her head about a foot was the thermometer by which she regulated the atmosphere of the room. The children sat below her in the seats, and were suffering from the cold. I asked her the temperature of the room, and she said she kept it up to 75 and sometimes 70. The thermometer being in that position and the children occupying seats down lower, sitting there for three hours in that position, I could readily understand the difficulty.

Dr. J. H. Kellogg: I will correct the impression that my remarks seem to have conveyed—that I am entirely opposed to out-door recess. I think the recess that the Doctor referred to in Philadelphia is a very commendable one, that is, to let the boys and girls take a recess together. I think it would be conducive to good results, but they are under the supervision of the teacher all the time.

Dr. Henry B. Baker, Secretary, State Board of Health, Lansing: I am in sympathy with the spirit of the resolutions. If I had had the writing of them myself, possibly I might have made a few minor changes. I think, however, that we need not insist on a vote on the resolutions at this time, because they might be considered again later in the session by the other side, the school superintendent may desire to be heard. I think possibly, it might be well to leave the question open for a while. I therefore move that the further consideration of the resolutions be postponed until after the address of Dr. Avery.

The motion was seconded and carried.

VENTILATION OF RESIDENCES AND PUBLIC BUILDINGS,

BY HON. JOHN AVERY, M. D., PRESIDENT OF THE STATE BOARD OF HEALTH, GREENVILLE.

(Reporter's Abstract.)

Mr. President, Ladies and Gentlemen: I see that I am invited to talk upon the subject of ventilation of private and public buildings. You have, right here in Battle Creek, I believe, one of the largest, best appointed, best heated, best ventilated and best managed public institutions in the world. You have as the Superintendent of that building a man who could tell you just how many times a man or woman ought to breathe in a minute, and just how much oxygen one ought to take in at each respiration, and just how much carbonic acid gas one ought to give out at each expiration. You have a man who can talk and write as clearly upon the subject of ventilation as any man I know of in the State, and it seems to me that he is abundantly able, and I know that he is entirely willing at all times, to give the citizens of Battle Creek any advice that they may want upon the subject of ventilation. So I have been a little at a loss to know what to say here upon this subject. To give you any practical information upon this subject, is extremely difficult. There are general principles that are familiar to all sanitarians and familiar to every person. There are certain general principles that can be observed. But every house must be treated upon its own merits, must be treated independently and in its own particular way, though in accordance with these general principles.

Now, the subject of ventilation and of heating are so closely connected, that it is impossible to consider them independently of each other. If we are going to have a house thoroughly ventilated, we want to know how it is going to be warmed; we have to take that into consideration, because heating is the force that sets the air in motion all the time, and if the owner desires perfect ventilation in the building we must know just exactly what the building is to be used for, how many people are to be in it, and how long people are to be in it, and so of the number of rooms and other things which are absolutely necessary for us to understand before we can give a thorough detailed plan of the ventilation of any private or public

building. Let us first consider the heating of the building. The ordinary method of heating our private residences here in Michigan, is by a stove. That is the ordinary method; of course a great many people use steam, some of them use hot air furnaces, some of them use grates, but the large majority of the people of the State of Michigan, and in fact, of the United States, depend upon the closed stove for heat. Now, this does not furnish ventilation, or make any provision for ventilation whatever. It simply heats by radiation, it does not introduce into the building one single mouthful of pure air. It does not provide for the building an outlet of one single particle of foul air or bad air. Now, in the first place, in order to ventilate a room, ventilation of course means the free distribution of air in the room. We build our houses with a view, in this county, of shutting out the air. We say the air is free, but we build our buildings for the purpose of shutting out the air from our rooms and from our houses. We make the doors and windows and the walls of the house just as perfect and as tight as we can. We do everything that is in our power to exclude from our houses the air. Then we go to work with our closed stoves and attempt to warm our building, and the result is that that small little spot, right about the stoves, is the only place that is warm, and the cold air is coming in through the windows and the doors and the walls of the house, and while our faces are being burned by the heated stove our backs are being shivered and frozen by the cold draft that is coming in through the windows and doors.

In the first place, it should be understood that good ventilation, like every other need about a house, costs. We cannot thoroughly warm and ventilate a house unless we expend some money. I have heard men talking that they could ventilate for $75 or $50 a house thoroughly that never had any provision in it for ventilation, but I never have found them able to do it. I have never been able to find out how it could be done without the expenditure of money. We expend money in paying the architect to draw our plans, and to have them properly ornamented, and in the proportion so as to please the eye, one hundred to one thousand dollars, it does not matter to us when we come to please the eye and to make a fair showing in our city, but when you talk about expending two hundred dollars for heating apparatus for ventilating your house, or five hundred dollars for it, then it becomes quite another thing. Now, I submit to every intelligent and thoughtful person, whether of the two hundred dollars or five hundred dollars which is spent in ornamentation of houses, were put where it would serve the health and comfort of the household, rather than to please the eye of the passer-by, it would not be far better.

The first thing to do, in order to ventilate a house, is to provide some means for the foul air to get out; for the bad air to get out of the house. Now, how can we do that? In the first place, we must have a heated flue, a chimney and of sufficient capacity to carry off the bad air, depending entirely upon the size of your house and the size of your rooms and the number of rooms contained in the house. If one chimney is not sufficient you must have other chimneys, and in a large house one chimney is not sufficient, so you must multiply your chimneys and you must heat these chimneys; you must provide means for getting air into them, and then with the heated chimney flues you have two currents of air leaving the room. Now when the bad air is taken from the room, you are prepared to supply its place by warm, pure air coming into your room. That can be accomplished in various ways.

Experience has shown that the proper place to remove foul air is at the floor level, in every case except in large rooms, or on some special occasions. Ceiling ventilation may be provided for, but, as a general rule, the proper place to take out the foul air is at the floor level. It does not matter so much at what point in the room the warm air is introduced. The grate in a room is one of the finest ventilators that can be provided, the coal or wood grate. The objection to warming the room by a coal or wood grate is the waste of heat. The large proportion of the heat goes up the chimney and is wasted, but it takes up with it the bad air from the floor, and leaves the room thoroughly and perfectly ventilated, provided you have made provision for supplying the place with fresh air. Then you have perfect ventilation. There are several devices for economizing the heat of the grate. The main difficulty that has been found is the size of the chimney that is generally connected with the grate. If your chimney is large enough, you can extend from the opening of your grate to the top of the chimney a galvanized iron pipe to conduct the smoke up through it, leaving the space between the chimney walls and the pipe to contain pure air, admitting it from out of doors at the back of your grate, and taking it out through a register at the ceiling in the same room, or carrying it to the room above. The air will be warmed by contact with the smoke-pipe in the center of the chimney, and thus the heat utilized which otherwise would pass off up the chimney.

In building your house for residence purposes the hot-air furnace is probably the most economical and the best, and, all things considered, is preferable for dwelling houses. However one advantage which steam has over hot air, dry air, is the want of capacity of the hot-air furnace. You ask too much of a small furnace, and you heat it too much. In order to accomplish the work you have to get one of sufficient capacity.

Now in regard to school houses, (I am glad this subject was brought up), I am in entire sympathy with matters pertaining to school hygiene, and I hope the subject will receive a fair and candid discussion. The State Board of Health has had in contemplation, a dozen plans for school houses of moderate cost, for the benefit of the school districts throughout the State. We have found that there are on the market, at the present time, three or four different kinds of hot-air stoves. Now there is no practical difference between the warming and ventilating of a school house and the warming and ventilating of any other house. What I have said with reference to the ventilating of private residences pertains completely to school houses. We believe that in a few years no school district will think of building a school house without making adequate provision for heating and for ventilation; and the same for all public buildings. We believe that the time will come when the law of the State will demand that every plan for a public school building shall be submitted to some competent authority for inspection and approval, before the trustees are permitted to go on and build it.

RESOLUTIONS CONCERNING SCHOOL HYGIENE.

The resolutions relative to school hygiene, introduced by Mary E. Green, were then taken from the table, concerning which resolutions A. Arnold Clark spoke substantially as follows:

REMARKS BY A. ARNOLD CLARK.

This is, in my opinion, one of the most important subjects that will come before this convention, not only because every person spends about one-third of his entire life in the school room, but because it is the most important time of his life, for it is then that he is forming habits both of body and mind; whether we shall go through life with normal eyes or abnormal eyes, with bodies weak or strong, depends very largely upon the conditions with which we are surrounded in early youth.

Dr. Avery has very properly emphasized the importance of the proper ventilation of school houses. As a lighted match will go out if placed in a jar from which the pure air has been exhausted, so a scholar's brain will be dulled and his body weakened in a school room, where the pure air has all been breathed up and there is no provision for admitting any more. Now, it is asserted that school rooms ought not to contain over six parts in ten thousand of carbonic acid gas, but very frequently in Michigan schools there is four times as much carbonic acid gas as there should be. That means that ventilation is imperfect; it means that those more deadly poisons from lungs and body and the germs of disease are not carried off as they should be.

As to the recess question I believe that the resolutions are a movement in the right direction. I think so for two reasons. In the first place uninterrupted work is bad for the eyes. The eyes of over one hundred thousand students in Germany have been examined, and it has been found that near-sightedness increases with attendance at school, Prof. Agnew conducted similar experiments in New York, Brooklyn and Cincinnati, and came to the same conclusion,—where only three in a hundred of the younger pupils were near-sighted, among scholars 20 years old 27 in every hundred were affected. In the second place I think that the child's mind needs the recess. It is estimated by the best authority that a very young child can only study one subject two minutes, between the ages of 5 and 8, 15 minutes; at 12 years of age, 30 minutes; but this not more than three hours a day. I fear that teachers with trained attentive powers do not always appreciate this. The expert penman does not tire so quickly as the green hand, but after writing a few hours the muscles of his fingers tire. A man runs a mile and the muscles of his limbs need a recess. We talk of shoemaker's cramp and ballet dancer's cramp; so, constant application gives us the headache and makes us near-sighted, brain and eye cramp.

I am also in favor of these resolutions because they advocate physical culture in the public schools. It is to be hoped that our schools will soon introduce this great reform. Introduce physical training in the public schools and there would perhaps be no need of a recess,—this great problem would be solved.

I am also in favor of these resolutions because they require the health officer to look after the scholars. Your health officer receives the enormous salary of $100 a year and you should see that he earns it. Mr. President, what the citizens of Battle Creek ought to do, is to pay the health

officer enough that he may devote his entire time to his duties and then require of him this very important work mentioned in the resolutions.

The subject was further discussed by Dr. J. H. Kellogg, when, on motion of Dr. Baker, the resolutions were adopted unanimously.

Fifth Session, Thursday, June 26, at 8 P. M.

The session was called to order by the President. After two vocal selections by Miss Maude Richardson of Chicago, Dr. A. W. Alvord read the following paper:

HABITS IN RELATION TO HEALTH.

BY A. W. ALVORD, M. D., BATTLE CREEK.

The greatest measure of health is possible only under the best conditions. Heredity comes looming up for a large share of our consideration when discussing this proposition, but unfortunately for our purpose *we* are not the conservators of our own interests in the matter of heredity and have only to do with coming generations. There remains only for us to take these bodies as we find them and do the best possible. The ills and ails of life are thickly strewn along our pathway but the key to better conditions usually lies in habit. He who gives loose reins to passion or inclination soon forms habits of pernicious tendency that will be most difficult to overcome, while those who persistently struggle against the tide of evil that eventually seems so easy to us and try for better things, will soon form habits that help to improve the physical as well as the moral nature. Habits like rivers have small beginnings, but as their lines begin to lengthen, their force increases until at last, borne on by their resistless sway, we are powerless to check our course. In youth we form habits that cling to us through a lifetime with a pertinacity that shows their mastery of us. As nutrition forms the basis of everything in our natures both good and ill, it will be highly proper to begin with this in discussing this subject in detail.

He who has learned to eat well has solved half the problems in health already. With fixed habits based on an intelligent understanding of one's needs he eats and drinks that which will best develop a healthy being, and in the way best adapted to all its harmonies. The result is a well nourished organism and a grandly developed being.

It is most fortunate also that the formation of good habits in eating does not require us to run counter to our natural tastes, our likes and dislikes, but only to those that are artificial. Among the wealthier classes of society the tables are daily loaded with foods requiring unnatural appetites and tastes to enjoy them, and an unknown kind of stomach to digest them, consequently the sanitariums, the hotels, hygeia and the numberless health resorts are crowded with patients with well filled pocket-books seeking to restore the lost art of digestion, while the poor man, never having time or money to lavish on an unnatural diet revels in the joys of a healthy digestion, eats the food that a kind providence has supplied in very nearly the form and condition in which it should be taken. It is deplorable that we can include but a limited number in this category of healthy livers. But

there is a class of people who have no time to eat properly, who evidently think that it is wholly unnecessary to take the time needed to properly chew their food. The doctor is well acquainted with them. They are mostly business men, clerks, mechanics and the ambitious man everywhere. These not only eat badly but if they are heated by undue physical exercise they eat and drink just the same without taking time to regain their physical equilibrium though they will be laid up the next few days as a penalty for the transgression of one of natures best known laws.

The habits of eating between meals and eating late suppers are fruitful causes of mischief—hence suffering. It is a pitiable thing to see a family of otherwise healthy children forming habits of eating that will sap their future happiness and their future usefulness, as surely as the habit of imbibing intoxicants possibly could, and to almost as great a degree. Yet christian parents sit calmly by and see the mischief go on. It is a matter of some trouble to parents to carefully study up the hygiene necessary if children are to make healthy men and women, but we maintain that it is an obligation resting on all parents to do this and aid their children in forming such habits as shall ensure health under favorable circumstances. It is not my purpose to make an appeal in favor of prohibition, but I must speak from a physiological standpoint in reference to the frequent use of stimulants of whatever form. The physiologists have shown conclusively that alcohol is not a food, does nothing to build up the animal economy. A few years ago this could not be said. The profession was divided. Richardson of London, Flint of New York, Palmer of Ann Arbor and Davis of Chicago stood almost alone in the advocacy of these ideas. But those who were fortunate enough to listen to that wonderful production of the fertile brain of Ex-President N. S. Davis at the recent meeting of the American Medical Association in Nashville must have felt that whatever had been their former beliefs, the weight of testimony to that effect from nearly all the best authorities without regard to nationality, abundantly proved that alcohol was neither a food, nor had it the power to aid the act of digestion, but was rather a hindrance. Certain it is, that the continued use of any form of stimulants lessens the power of the stomach to do its necessary work, robs the nervous system of its best vitality and lowers the heat-producing force. The alcohol habit is especially severe on youth. Like the tobacco habit, it is the especial bane of young men. Both act on the nerve centers in such a way as to materially affect the heart and other vital organs and thus shorten life. Insurance companies are extremely particular on this point, and the better ones will not admit any young man who has formed either of these habits in excess.

The habit of regularity in all physiological action is of prime importance, notably the habit of retiring and rising. Vital force is much increased and years are added to the ordinary life by attention to these rules. The continued habit of early retiring will ensure good sleep, which is so important to restore to normal action our exhausted energies. No doubt some can safely form the habit of late retiring and prolonged refreshing sleep will follow and you will see the man at his best again the next day. But where one succeeds a hundred fail of needed restoration and only burn the candle at both ends.

The habit of moderation in work and in play, in singing and in talking is of great value, both before maturity in developing into the best possible and after maturity in prolonging a life worth living.

The American habit of rapid living and rapid action is too expensive. It may make brilliant men but it can not make serviceable men. Their light goes out to soon. Before they have fairly become proficient, they must lay down their work and another will learn it. Hence the best is never attained. This is true in the arts and in literature as well as in business and mechanics. Conservatism should be the watchword among Americans today. It would give added profits to the employer and added years and proficiency to the laborer.

THE PRESENT AND FUTURE WATER SUPPLY OF BATTLE CREEK.

DISCUSSION LED BY PROF. DELOS FALL, MEMBER OF THE STATE BOARD OF HEALTH.

(Reporter's Abstract.)

You have, as I understand from the program, heard much today concerning ventilation. It is not fresh air that we are to discuss tonight; but fresh pure water, how to obtain it, and how to guard it; how to keep it in a state of purity when it is obtained; and how to recognize it as pure water, and to appreciate in some degree the dangers surrounding it. I know about the water of Battle Creek, simply what I have learned since the four o'clock train brought me to this city this afternoon. I know a little more about the sanitary condition of it. I know that in Battle Creek some use the water from the public supply, and others depend still upon wells for their supply. I know something more about certain places than I do about this place; you, yourselves, may draw the parallel, and may make the application of any comparison which in my talk to this convention, I may bring out, about your own water-supply.

Two years ago last October, if we had gone into the little village of Iron Mountain, in the upper peninsula, we would have found that hey were suffering under a terrible epidemic of typhoid fever, of very virulent type. And if we had investigated the conditions of that epidemic (as certain sanitarians did), we should find the condition to be as follows: a city containing ordinarily about 4,800 inhabitants and swollen by transient people numbering about 2,000, making a total of 6,000 people or over, living in about 1,000 houses which lay in a valley with hills on every side, the village occupying both the valley and the hill sides, with soft, porous, sandy soil, the water used by the inhabitants being drawn from the public supply and particularly from wells. Our sense of smell would have been greeted in those days by an odor that came from many places where refuse matters had been deposited, and where under the action of the atmosphere and the sun, they were decaying, and sending off their noxious gases. If our minds were diverted to the water-supply we should have to determine between the contaminated water of the public supply and the contamination of the water of the wells. Now that is a matter that was quite easily settled in this case. For it was found that all of the cases of typhoid fever in this epidemic, were those who used water from the wells, and that the people who used the public water-supply were quite exempt from that disease. There were 350 cases of typhoid fever in this village, ten per cent of which were fatal.

Now let us compare with this another case, which has become a noted one, in the town of Plymouth, Pennsylvania, a borough lying on the mountain side and on the bank of the Susquehanna river, about three miles below the city of Wilkesbarre. In 1885 a terrible epidemic of typhoid fever broke out in this village, and some 1,100 cases occurred, with 110 or more deaths, ten per cent of all the cases proving fatal. This was a city partly drawing its water-supply from wells, and partly from a clear, running mountain stream. They had springs of remarkably pure water, gathered in reservoirs and large receptacles, and distributed through the city to a large number of people, who depended for their water-supply on these streams. Another portion obtained their water-supply by pumping at times from the Susquehanna river, another portion of the city obtained their water drawn entirely from the river, and another portion still used water that was pumped from a mine located near this city. Now these various sources of water-supply must be held in mind for a time while we investigate (as was carefully investigated there) the cause of this epidemic, or the source of it. It was found in this case, that where the water from this clear, running mountain stream was supplied to the inhabitants on one side of the street, and the inhabitants on the other side of the same street drew water from wells, the latter people were entirely exempt from this epidemic, while those who took their water from a hydrant of the water-supply were the victims of the disease. Now, that statement is made on the authority of a long, careful and painstaking investigation, made by the State Board of Health, of Pennsylvania, proving conclusively that the facts were as I have stated them. This investigation also proved conclusively that the whole number of these cases sprang from a single case, from a man who had had typhoid fever in a house situated a little bit away from this mountain stream, whose dejections had been cast upon the ground, near to this stream—on the water shed leading into this stream, and these germs of typhoid fever found their way from this patient, into the reservoir, thus getting into the public water-supply and then breaking forth among the consumers. So that the 1,100 cases and the 110 or 114 deaths were, beyond doubt, proved to be the result of the contamination of the water-supply by a single typhoid fever patient. That epidemic in that town, was considered for the following year in the report by the State Board of Health of Pennsylvania, and you can there find the name of every person suffering from typhoid fever during that epidemic. The number of days sick, the wages which those persons would earn, the expenses of the physicians, and the burial expenses of those who died, are all carefully estimated, so that the amount can be stated quite accurately, even to a few cents, and the cost of that epidemic, in that small town, smaller than Battle Creek, was $97,120, almost a round $100,000, resulting from this epidemic caused by a single typhoid fever case.

Now the people of Battle Creek that are using water out of wells, like the Iron Mountain inhabitants may well consider that case, and those who take their water from the public supply of Goguac lake, may well place this Plymouth case along side of their own conditions. I understand that this lake not only supplies water for drinking and cooking purposes, but that it is used for the purpose of a summer resort by the inhabitants, not only of Battle Creek, but elsewhere, and is used for that purpose quite extensively by people who go upon the shores of the lake and rest, for the benefit of their health and for recuperation. Now it is an easy and con-

ceivable case, to suppose that someone with the germs of typhoid fever in the system, should bathe in the waters of this lake. It may be unintentional on the part of this person for one may be suffering from typhoid fever for a few days and yet not be aware of the true state of his condition; it even deceives the attending physician; yet at the same time the dejections from his body are necessarily filled with the germs of typhoid fever, and are liable to create that disease in any number of persons who may drink that water. Now I say that is an easily conceiveable case, that some one person afflicted with this disease may bathe in the waters of Goguac lake, and may go to such an extent of carelessness as to allow dejections from his body to pass into that lake. Thus you may have an epidemic spring upon this community at any time. Now it is the duty of the people to see that in the future matters of this kind are guarded against.

There are different ways of obtaining a good water-supply. The single well, the artesian well is one of the best ways. I should say that the latter case was the more preferable one, from the fact that when a single well is well chosen as to site all sources of contamination may be guarded against, while it is next to an impossibility to control a large body of water and the land surrounding it, like your lake here, and preserve it from possible contamination. At all events, it is, in the matter of selection, most essential to consider carefully the purity and protection of the water from any possible contamination.

Hon. E. C. Nichols: I would like to ask the speaker concerning the depth and size of the artesian well at Albion.

Prof. Fall: It is an eight-inch well, and the depth of it is 95 feet.

Mr. Nichols: What would you recommend where all attempts at artesian wells have failed; that is, where a large number of wells, notably of four, six and eight inches in diameter have been sunk, in some instances to the depth of 285 feet, without striking any water at all?

Prof. Fall: That is a very discouraging condition of affairs, to be sure. It occurs seldom in Michigan. I know of just such a case at Ann Arbor where they penetrated in some cases 200 feet, without finding water. I think that in most places in Michigan you can get water comparatively easy.

Mr. Nichols: I thought perhaps in your experience you had heard of similar cases, and possibly some other solution of the problem had been discovered. I believe that in this valley, for a circle of quite a number of miles, we are not within the water bearing rock where we could strike it by an artesian well. I believe there has never been such a thing as a flowing well here, with any considerable supply of water running very near the surface.

I think it would be well for us to consider under what possible conditions, if we would make an experiment, a satisfactory flow of water might be obtained.

Prof. Fall: Thought that if an artesian well could not possibly be secured, the lake should be carefully protected.

Mr. Nichols: There are some peculiar conditions which surround Goguac lake. Notably, these: With a well dug at the margin of the lake (as one was dug) 25 feet in diameter and carried down to the depth of twenty or twenty-five feet, the material became a fine quick sand which practically floated in the water, showing that the water supplied to this lake evidently does not infiltrate through the surrounding soil. At least

there was no connection between the lake and the well, or the level would have been the same, which it was not.

Prof. Fall: Possibly the people in Battle Creek do not appreciate that well as thoroughly as they might. I understand that the water in that well is much cleaner than the water in the lake. It seems to me that the citizens of Battle Creek ought to insist upon that well water being used to the fullest extent possible, and especially in the hot summer months. It seems to me that this would be a vast improvement of your water-supply system, to use this well to its fullest extent, and possibly another like it.

Mr. Nichols: The water in the lake is better than any water in any well in the city of Battle Creek. The water of the lake is, unquestionably, from a scientific standpoint a water unknown in any of the local wells, or any of the local streams.

Prof. Fall: There is no doubt but the water in your wells in Battle Creek is contaminated. It must be so. If you will consider the small area which the common householder owns and the points of contamination that are placed upon that small area. Here is the house, near to it is the cess-pool, and that awful, black spot, that relic of barbarism, the privy vault. These are all upon the same little square of ground that the man owns. It is a plain case, then, that there is no pure water in your wells in Battle Creek. Think of that! Insist upon it, in your own mind, as a scientific fact and you will assent to it, if you think about it. You have been accumulating this filthy mass these 25 or 30 or 35 years; but I believe the water in that particular well is better than the water in the lake. I understand that the water is drawn almost exclusively from the lake; that the pipe simply runs through the well.

Mr. Nichols: Every drop of water the well will contain has always been used, because of its cooling properties; but it is my opinion that the water in the lake is better than the water in the well.

Prof. Fall: I wish to ask a question: Is the valve adjusted so that the water from the lake may be closed off until the water in the well is exhausted?

Mr. Nichols: Oh, certainly, the valve in the pipe from the lake has been closed to the extent of supplying all the water that the well can furnish, but I still believe that the water in the lake is better than the water in the well.

Henry B. Baker: I would like to make one point, if I may be permitted. Mr. Nichols seems to think that the purity of the water is a question to be decided by chemists. Now, it seems to me that the chemists can tell us very little about it. I wish to refer to the same illustration that has already been mentioned by Prof. Fall,—the epidemic of typhoid fever at Plymouth, Pennsylvania. The editor of the "Sanitary News" in Chicago was public spirited enough to send to Plymouth, Pennsylvania, and get a sample of the water from that mountain stream, and send it to one of the chemists in this State for analysis; he wanted to publish the result in his paper. He also had collected for him water from the wells in Plymouth, Pennsylvania, and sent that, and he published the results of the analysis. The result was that the chemist pronounced the water from the mountain stream to be fairly good, but he declared that the water from the wells in Plymouth was "more fit for the dung-heap than the dinner-pot." Yet it was found that the typhoid fever was not caused by the water in the wells, but it was caused by water from the mountain stream. Now I tell this story to illustrate the point that I want to make, that the *chemist*

cannot tell much about it. We must have a biological test. But I would go a step farther, and would look at the *probability* of its being contaminated; I think that is really the only means of forming a correct conclusion. By an analysis, we have only some *indication* of what is going on. I have no doubt but what the wells are contaminated, but so long as they are free from that particular plant that causes typhoid fever, typhoid fever is not likely to develop in the systems of those who use the water. If you have water in Goguac lake as pure as crystal and it comes directly from the clouds, and it does receive the germ of typhoid fever, a large proportion of the people who use that water are liable to have typhoid fever, and it makes little or no difference what the chemical analysis shows.

Hon. Perry Mayo: Allow me to make a suggestion, which may not be practical in this city, but it was practical at the Soldiers' Home at Grand Rapids. It was desired there to obtain a pure water-supply; and it was drawn first from a running brook, but it was considered dangerous, for the same reasons stated here tonight. The water-supply was then secured in this way: They sunk a large number of drivewells, I think they went through one strata of water. I do not remember how many wells were sunk, but at any rate they spread over quite an extent of territory. These wells were all connected to one pump; they were connected by pipes below the ground so that when the water was exhausted from one it flowed freely from all the rest. In that case it was a complete success, and the water-supply has always been abundant. I do not know whether or not such a system would work in this city.

The President: I would like to inquire whether there is anything in any known geological conditions here which would preclude the possibility of artesian wells? I have heard it said that in view of the conditions underneath we are outside the area in which to sink artesian wells.

Dr. Alvord: When it was first proposed to get water from the different lakes, three different samples of water from Goguac lake were brought to me for analysis. I made the analysis and found that the water was unfit for use. This was owing to the fact that the water was taken from the top of the lake. I suggested that water be taken from a depth of fifteen or twenty feet, which was done, and I found it to be most excellent. It was only a few months before it was decided to use Goguac lake water as a water-supply. From the time that the lake has been used as a water-supply to the present time, three months have never elapsed when I have not analyized the water, and I believe the supply of drinking water from Goguac lake to be exceptionally pure.

I had previously been to the expense of putting in three different wells in my lot, and got very fair water from the third well, as far removed from all sources of contamination as I could possibly make it, but the drinking water from that well is not chemically pure when compared with that of Goguac lake.

We have had a good deal of typhoid fever since the supply of water has been taken from Goguac lake; but I have yet to see the family drinking Goguac lake water that has had typhoid fever in the house; and I know of many cases in families living contiguous to these where the supply of water has been furnished from their wells, which were the occasion, we believe, of the typhoid fever. But Dr. Baker, for whose opinion I have a very great respect, indicated that the water was not biologically examined. Well, that point is well taken so far as it goes, but it is a very little way that it goes. The supply of these germs must be quite large,

before we can find them in the water at all. In the second place, if the water is chemically impure, Dr. Baker will not hesitate to say that it is very much worse than that which is chemically pure. The danger in drinking water chemically impure is much greater than in drinking water which is chemically pure. Taking a history of the whole matter, and our experience in typhoid fever, unless we have a case of typhoid fever where the dejections of the patient are likely to contaminate the water-supply, I feel perfectly safe in drinking the water from Goguac lake.

Dr. Baker: I would like to ask if it is not true, as Prof. Fall has suggested, that that accident may occur any day in the year? (Referring to this possible contamination of the water of the lake by the dejections from a typhoid fever patient.) It seems to me that this is something to justify Prof. Fall in making that suggestion, and should it occur at any time, and like the town of Plymouth, 1,100 cases of typhoid fever break out without any warning, you may know where to look for the cause of it. I think I did not make myself understood with reference to the biological test. What I said, was, I would not have confidence even in that. I would have more confidence in following out the line of suggestion by Prof. Fall, and I would try to see if it were not possible to obtain a water-supply that would be reasonably safe from the accidents that he suggested,—to do something to prevent a similar possible occurrence to that at Plymouth, Pennsylvania.

Prof. Fall, in answer to questions by Mr. Nichols, stated that subterranean water was pure, unquestionably, because subterranean water was obtained from below an impervious layer of rock, thus being free from surface water.

Dr. Baker considered that unless the depth of 1,000 feet had been reached in the search for water, the search should not be abandoned, as at that depth good wells were often found.

Dr. Metcalf made a few pointed remarks on the probable condition of the water in Goguac lake after the encampment.

Prof. Fall recommended that all water be boiled thoroughly before using, if any danger was anticipated from the water, because boiling the water would destroy the germs.

Dr. Kellogg considered it safer to keep Goguac lake as it is and not allow Minges brook to be opened into the lake, as that stream is most impure, and Mud lake, the source of the stream, is a reservoir of filth.

A vote of thanks was extended to the gentlemen from abroad who had done so much to make the convention a success, after which President Graves made a few remarks and the convention adjourned.

5161.11

MERICAN

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

ALPENA, MICHIGAN,

JULY 10 AND 11, 1890.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF ALPENA.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1891.]

[No. 342.]

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ALPENA, JULY 10 AND 11, 1890.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1891.

[No. 342.]

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

ALPENA SANITARY CONVENTION.

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT ALPENA, MICH.,

JULY 10 AND 11, 1890.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1891.

This convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Alpena, acting with a committee of the State Board of Health.

The following named persons constituted the various committees:—

Committee from the State Board of Health.—Henry B. Baker, M. D., Lansing.

Local Committee.—Dr. Charles Howell, Chairman. Dr. W. E. Ziegenfuss, Dr. J. D. Dunlop, Dr. Duncan A. Cameron, Hon. W. L. Churchill, Hon. George J. Robinson, John Monaghan, Dr. W. A. Secrist, Prof. F. S. Dewey.

Finance Committee.—Hon. Andrew W. Harshaw, Michael O'Brien, John Monaghan.

Music Committee.—Dr. J. D. Dunlop.

Reception Committee.—Dr. Duncan A. Cameron, Dr. W. E. Ziegenfuss, Dr. W. A. Secrist.

Executive Committee.—Hon. Worthy L. Churchill, Hon. George J. Robinson, Prof. F. S. Dewey, Dr. Charles Howell, Dr. Henry B. Baker.

The officers of the Convention were:

President.—Hon. Worthy L. Churchill, Alpena.

Vice Presidents.—Hon. George L. Maltz, Alpena; Hon. J. H. Stevens, Hillman; Dr. D. W. Mitchell, Harrisville; Dr. George H. Shelton, Detroit; Dr. A. M. Gerow, Cheboygan; Andrew W. Comstock, Alpena; Dr. Frank P. McCormick, Black River; Dr. J. V. White, Oscoda; Dr. Frederic Denny-Larke, Rogers City.

Secretary.—Hon. George J. Robinson, Alpena.

Assistant Secretary.—A. Arnold Clark, Lansing.

FIRST SESSION.—THURSDAY, JULY 10, AT 2 P. M.

The session was called to order by the President. After a vocal solo by Miss Moore, and prayer by Rev. H. H. VanAuken, Michael O'Brien, Mayor of the city, gave the following address of welcome:

ADDRESS OF WELCOME.

BY MICHAEL O'BRIEN, MAYOR OF THE CITY.

Mr. Chairman, and gentlemen of the convention:

You are assembled here today, as I understand it, to spread the doctrines of sanitary science, and to teach us how we may best preserve our health. You have selected our city as the theater of your scientific deliberations, and with utmost pleasure and consideration, in the name of its citizens, I welcome you to its shores and commend you to its hopitality.

Health is the choicest gift from God to man. Without it, life is a perpetual burden, and love, peace, happiness and contentment are unknown. There is no treasure of which man is a greater spendthrift than his health. And yet, his intelligence teaches him that all the gold in the mines of Golconda cannot purchase this priceless pearl of his prodigality. Man violates the laws of Nature in his own person, and suffers accordingly. Society suffers in the same way; leaves large districts undrained and streets uncleaned. Masses of the population live crowded together in unwholesome houses, poisoned by the impure air of the neighborhood, till at last disease spreads, from public carlessness or private uncleanliness, from the crowded tenements to the comfortable homes of the rich, carrying death and devastation to poor and rich alike. The misery and untold suffering incurred in cases like this, constitute criminal carelessness in the light of the sanitary progress of the closing years of this marvellous century.

The healthy home may be the abode of comfort, virtue and every happiness. It is the scene of every enobling relation in the life of the family. It is the training ground of future immortals, a refuge from trouble, a consolation in sorrow, a pride in success, and a joy in all seasons and at all times. We well know that one of the first methods of raising man above the animal creation, is by providing him with a healthy home. Experience, that awful school where lives are lost and reputations won, teaches us that after all, the *home* is the surest school to mold the millions of the world. Here it is that boys become men, and young girls bloom into womanhood; here it is they imbibe their first principles of morality, be they good or bad, and those first impressions made upon the soft and tender minds and hearts of the young, never become wholly obliterated. "As the twig is bent, the tree is inclined" is an adage to the truth of which many of us here today can testify.

Gentlemen, we are more than pleased that you have selected our city as the place of your present deliberations. We boast of its progress, and glory in the busy hum of its industry; its pure air and wholesome surroundings bid defiance to the malarial and miasmatic plagues of less favored sister cities. Never since we have reached the dignity and assumed the responsibilities of cityhood, has plague or epidemic been able to withstand the healthfulness of our climate or the skillfulness of our physicians, with but one exception. We are glad you have come, because we believe that

sanitary conventions are productive of beneficial results, both to the city and the people. They invite closer attention to public health through the never-failing channel of public cleanliness. But I have often thought that we who boast of our superior civilization could well take lessons in sanitary science from the eastern nations of centuries ago. Among those nations generally, cleanliness was made part of their religion. With them, it was surely next to Godliness. They connected the idea of internal sanctity with external purification. Side by side with Mahommedan mosques were built magnificent baths, where the people found ready means of cleansing previous to public worship.

We pick up the daily papers, and are horror-stricken at the awful catastrophies where lives are daily lost, and yet, unnoticed, thousands go down to the eternal silence of the tomb year after year, through carelessness of the health, and ignorance of the science you are assembled here to teach.

It has been asserted by gentlemen high in authority in sanitary science, that more people die through plagues and epidemics brought on by public uncleanliness, every year, than were lost by the allied forces on the awful field of Waterloo.

Gentlemen, I will now close, by again, on behalf of our citizens, extending to you a hearty welcome, and sincerely trusting that your deliberations within our city may be pleasant to you, and profitable to the people at large.

RESPONSE AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

BY HENRY F. LYSTER, M. D., MEMBER OF THE STATE BOARD OF HEALTH, DETROIT, MICH.

Mr. President, Ladies and Gentlemen:—

It has fallen to my lot, according to the program, to respond to the mayor's address and to make a statement of the objects of this convention.

With reference to the city of Alpena, we have often heard a great deal about Alpena, rather in a favorable way. People who come from Alpena never say anything bad about it, but always give it a good name. The board of health some years ago, found that you had a few attacks of disease here, and we have had you under our observation for a good many years, watching to see whether there were any important facts wrong in reference to the town.

With reference to the public health and disease, the size of the audience does not by any means act as a criterion of the importance of this subject to the people of Alpena. The subject is an important one, and should interest the whole people, but the people at large are willing that ten men in one thousand should do their thinking. It is with public health as in political affairs, one thousand people will leave the ten to do all the thinking about the prevention of disease. There will be a large audience tonight, and larger tomorrow. Only a few of the more faithful are here this afternoon, and among them we are glad to see the ladies. When the ladies are interested in anything, then the country at large gets interested in it too, and a "little leaven leaveneth the whole lump" in a short time. There is great vitality about sanitary matters when the women get interested in them.

I promised the president that I would not be very long with reference to the many subjects before this convention.

The first object of the convention is the presentation of *facts*, which has always been the aim of these conventions as you have heretofore not had much fact, but a good deal of theory concerning those untimely deaths that are occuring every year. That word *untimely!* Now, what does that word mean? The State Board of Health does not want to prevent our dying when our time comes; but by the aid of sanitary science, we can ward off death till our time comes; but those untimely deaths are the deaths which this convention is trying to prevent. That untimely cutting off of children! The horrible idea of little children that come into the world in good health and are swept away, sometimes two or three in a family, leaving the heart of the parents desolate; and the family cares not whether sanitary science is enforced or not, since their children have all been swept away! It is such deaths as these which we would prevent.

Another object of the convention is the comparison of views, exchanging views, and leading people to think higher thoughts concerning the great laws of nature, and the ministry will bear me out, when I say that these are the laws of a Divine Providence. The more we know, the more we study and bring out the laws of nature, the better people we are; the more we can prevent disease, the more moral people we are. The person who is a student of the great divine laws and laws of the universe, the person who is versed in those laws and who applies them, is useful; he is of a higher moral tone than those who are ignorant of those laws. The ancient idea that a Divine Providence was punishing us for our sins by taking away our wives and children, shows ignorance of the intention of a Divine Providence. The innocent should not be made to suffer for the guilty. By the great limitation of disease which sanitary science affords, we could save these lives by the tens of thousands. I will not stop here to talk longer on this theme, but hasten along with the program.

The first subject is on alcohol and narcotics in health and disease. No child's play here; this is a very important subject—the use of alcohol in disease and health—this subject will be discussed this evening.

Another disease is here mentioned,—can consumption be prevented? This is certainly a subject of great importance, for if it is a contagious disease, we should know it.

Restriction and prevention of the dangerous communicable diseases, from the standpoint of the lawyer. We need the strong arm of the law to aid us in enforcing the laws of the State, and to show us what, and how to do. Also, from the standpoint of the minister. The church wields a great deal of power in these days, and by the interference of the church and the aid of an intelligent clergy in sanitary matters we can hope for a better condition of affairs. Also, from the standpoint of the health officer, and of the State Board of Health.

The next subject is the sewerage and drainage of Alpena. There is a subject of importance to all of the citizens of Alpena, hence we can all discuss that with some degree of interest.

The diseases of the teeth and their effects on health.

Ventilation and heating, and a good many can say a great deal more on this subject than they can prove. I think that will probably mark the high tide of the convention. A great many can discuss it with a great deal of heat, and some can ventilate it thoroughly.

The next subject is the water-supply of Alpena. This ought to be an interesting subject to the people of Alpena, for I presume all of them drink water here, such as it is. This question of whence we derive our drinking

water is one of interest here at Alpena, and I think this subject will occupy a good deal of the time of the convention. I hope that views will be so thoroughly expressed and ventilated here, that there will be such an interest manifested as to make the convention at Alpena one of the most successful sanitary conventions ever held in the State.

PRESIDENT'S ADDRESS.

BY HON. W. L. CHURCHILL, ALPENA.

The object of this convention, I think, has not been generally known to the people of this city.

Doctor Lyster tells you, it is not a medical convention for the instruction of professional gentlemen, but for everyone, to listen to the discussion of facts and comparison of views relating to the best methods of preventing sickness and death; a careful consideration, an interchange of thought and a combined action must result in good to this community. If we can by study, detect the cause of disease, how and where it is propagagated, and how it can be defeated, it is a plain duty to every man and woman in this audience to obtain such useful and practical knowledge upon this important subject, and adopt such methods as will procure these results.

Using the language of Hon. Samuel T. Davis of Pennsylvania, "The prevention of disease, from clearly defined specific causes, is a subject worthy the investigation of a lifetime, and a moral and political duty which man owes to his fellow man. To those who cure diseased conditions we would vote a crown of earthly glory and sufficient of this world's goods to enable him or her to enjoy all of this world's enjoyments.

"To those who prevent disease, we grant everlasting honor and peace as benefactors of the race of man, and entitled to all the honors of the former, and in addition the extolation of divine preferment beyond this short struggle with things temporal."

Many of the subjects to be presented and discussed during this convention are easily understood and comprehended by all.

The first on the programme is the "Water Supply of Alpena."

There certainly is not a person in this room but who is interested in any means of discussion that would shame or compel the water company of Alpena to give us pure and wholesome water.

It will be demonstrated to you during this convention by the learned gentlemen who will discuss the question, that the constant use of impure water is one of the greatest causes of disease. In localities where there is an abundant supply of pure water and pure air, malignant diseases are of rare occurrence. The death-rate is small; people's lives are prolonged. Because we are not taken instantly sick from drinking impure water, is no reason we will not be sick at some future period if we continue it. Today the system is in perfect health and capable of throwing off the poison, but tomorrow or next week, or next month, the system is in a different condition; it will not be capable of throwing off the poison absorbed from the use of impure water. The only safety against malignant disease is to destroy the germinating cause. *Demand pure water, insist upon it.*

I think it is a fact well known to the medical profession here, that

in the spring, when the river is acting as a great sewer to the vast country back, carrying off the decayed vegetable and animal matter accumulated in the swamps and cess-pools during the year, mixing with the garbage, waste and excreta from our own sewers, a strong current might empty and drive this foul mass into and commingle it with the bay water, spreading it out over the inlet pipe, where it is pumped up by the water company and furnished the citizens for drinking and culinary purposes. At such times typhoid and scarlet fever, diphtheria and maladies of malignant type become almost epidemic. Whereas, later in the season, when the river subsides to its natural flow, and the pure water from the lake penetrates to the inlet pipe and is pumped and distributed to the people, disease abates and the doctors complain of the painful healthfulness of the city.

So, ladies and gentlemen, you can readily see that it is the people and not the doctors who are the most deeply interested in all sanitary matters, such as the supply of pure water, the disposal of waste and excreta, sewerage and drainage, sanitary plumbing, heating and ventilation, and, in fact, every subject on the programme.

A perfect system of sewerage and drainage if not equally as important as the supply of pure water for the prevention of disease, goes hand in hand with it, and it is important that every one should obtain all the information possible on the subject, as the origin of all malignant communicable diseases can be traced to carelessness or ignorance of all rules of sanitary regulations.

For instance, scarlet fever and diphtheria simultaneously appeared in a family in this city, both contagious diseases, no knowledge of exposure could be obtained, as whether the disease was prevalent in that locality or in the city, the wonder was, where the germ of the disease originated. Upon investigation it was found that the waste pipe from the kitchen sink extended through the floor and all the waste was deposited on the ground under the house, which sat upon cedar posts and was tightly ceiled with no ventilation. This waste was there permitted to decay, and the poisonous gases having no other escape, permeated throughout the house. And there was never a doubt in my mind but that these diseases originated from inhaling, and the system absorbing the poison arising from the decaying waste deposited under the house. This is but one instance of the absolute ignorance of people generally of the first principles of proper sewerage and ventilation.

And I venture to say, should an investigation be made in this or any other city in this State, that equally as stupid contrivances might be found falsely called "sewers and drains," which are simply pit-falls and death-traps.

Relative to sanitary plumbing, heating and ventilation, my own knowledge is so limited I would not venture to express an opinion. I am here for instruction, and not to instruct. The subject is now agitating the minds of our citizens, *we all want light.* We are contemplating the erection of a beautiful and expensive school house. The question has already presented itself,—which is the best known method for heating, ventilating and disposing of waste and excreta? Factions have arrayed themselves one against another, for this or that theory, with but little knowledge upon the subject.

I hope that the papers read and the disinterested discussions held by the learned gentlemen at this Convention will throw more light upon the subject.

In conclusion, I will say, I hope that this Convention will awaken our citizens to a keener sense of the importance of active and energetic work in all matters pertaining to better sanitary conditions. And let us look forward to the time when Alpena will be noted not only for her beautiful situation, purity of air and delightful summer climate, but also for her comfortable homes, clean streets and walks, beautiful parks, pure water and good drainage, placing Alpena in the front ranks of sanitary cities.

The following letter of regret from Governor Cyrus G. Luce was then read:

LETTER FROM GOVERNOR CYRUS G. LUCE.

Lansing, June 30, 1890.

Dr. C. Howell, Alpena, Mich.:

DEAR SIR:—Yours of the 26th at hand. It would afford me great pleasure to come to Alpena for the purpose of meeting with the Sanitary Convention, but I only enjoy one vacation during each year, and that of short duration, and it is also enjoyed where it can be done without expense. I am going down to my farm on the 5th of July to watch the cattle chew their cud, and gaze with admiration upon the gamboling of the innocent lambs, run the reaper enough to keep my hand in, and shall leave Lansing on the 4th of July and not return until somewhere from the 12th to the 14th.

Hoping that you will have a pleasant and profitable time, I am

Sincerely yours,

CYRUS G. LUCE.

Second Session.—Thursday, July 10, at 8 A. M.

The session opened with instrumental music by Miss Potvin, after which the following paper was read.

ALCOHOL AND NARCOTICS IN HEALTH AND DISEASE.

BY J. D. DUNLOP, M. D., ALPENA, MICH.

Mr. Chairman, Ladies and Gentlemen:

The subject assigned to me, as you will see by the program, is, Alcohol and Narcotics in Health and Disease. It will be quite apparent to at least the medical gentlemen present, that 20 minutes, the time allotted to me, is entirely inadequate to do the subject or subjects anything like justice. I do not propose to treat the portion of my paper relative to alcohol from a moral standpoint; but simply from the standpoint of a physician, leaving its moral aspect to be treated of by others more capable. By alcohol in this instance, I mean the different forms or combinations of alcohol used as beverages; such as whisky, brandy, beer, wine, etc.

ALCOHOL IN HEALTH.

In health, alcohol in any form, or combination, is not required by the system, but on the contrary if taken even in small but oft-repeated doses, produces unpleasant and pathological effects, which show themselves in

many forms well known to the experienced physician. This fact has been demonstrated time and again by the experience of soldiers on long, exhausting marches, for it is well known that they stand hardships much better without alcohol than with it; also, by our great athletes, whose prowess depends on their physical powers being reserved, and their mental and muscular balance being maintained to its utmost extent. I need not waste your time by quoting proofs of these facts; they are well known to every person who has given the subject the least thought or study. It might be well, however, for me to explain to you some of the effects that strong alcoholic drinks have on the healthy organism, and the diseases that their continued use invariably brings on sooner or later, to those who use them habitually or at all immoderately. One very important and distressing disease is chronic gastritis or catarrh of the stomach. Roughly, the coating of the stomach is full of little follicles or peptic glands, whose duty it is to secrete or manufacture and throw out, the gastric or stomach juice. This juice is what dissolves or digests the food taken into the stomach for the sustenance of the body. The prolonged use of alcohol causes the mucous membrane or lining of the stomach to become coated with a tough, tenacious mucus which excites unhealthy fermentation of the food, and also causes changes to take place in the mucous membrane itself, altering its structure and causing it to thicken and become uneven, closing up the mouths of the little secreting follicles or glands, and causing a great diminution in the amount of gastric juice thrown out for the digestion of the food. The closing up of these little follicles also causes small cysts to form in the walls of the stomach. A person suffering with this state of things will usually vomit in the mornings a nasty, sour, bitter, tenacious substance, and is altogether a very miserable individual. He will be almost sure, however, to remind his physician when he consults him, that he is quite certain it is not anything that he has been drinking that causes the difficulty. I shall not dilate any on this dangerous and terribly unpleasant disease, but pass hurriedly on to a few others; notably, cirrhosis or sclorosis of the liver; this disease is caused almost exclusively by alcohol; there are other causes, but alcohol is the primary one nine times out of ten. As to some of the symptoms of this malady,—languor, pain, dizziness, loss of appetite, bad, sour, irritable stomach, coated tongue, disagreeable taste in the mouth, unhealthy, sallow looking skin, poor digestion, more or less difficulty of vision, often sleeplessness, sometimes the reverse, and nervous prostration together with an almost innumerable train of other distressing symptoms. This disease has sooner or later one invariable ending, for it is incurable. An exhaustive diarrhœa, perhaps, œdema of the lungs, heart failure, and death with his cold, relentless hand slowly but surely closes the scene. Alcohol also is frequently the cause of Bright's disease with its long train of symptoms, which go to make the poor sufferer's life one of perfect misery. Delirium tremens! have you ever seen a patient suffering with delirium tremens? Have you ever seen those glaring, unnatural eyes? Those hideously distorted features? Have you ever heard the wild unearthly shrieks for help or protection, as the poor victim entreats, begs, beseeches you to save him from the torments which he thinks are about to destroy him?

I call to mind at this moment, a case in my own experience: a stout, otherwise healthy young man, his eyes glaring like those of a demon or some ferocious beast, every muscle quavering, every chord strung to its utmost tenison, trying in vain to throw off visionary evils; one moment

calling on heaven to curse an innocent and weeping wife, the next in the most frantic endeavors to choke to death his sleeping babe lying in its cradle near by, yelling, screaming, cursing; half a dozen strong men using their utmost strength in their endeavors to prevent the rum-crazed maniac from destroying himself or family. Several medical men besides myself using as best we could, every remedy known to medical science. One terrible shriek, one violent convulsive seizure, and the powerful frame lies a heap of inanimate clay.

These are not pleasant pictures, still are only a few effects of alcohol in health.

ALCOHOL IN DISEASE.

Here I have quite a different story to tell; for, in spite of the fact that many of my professional brethren do not think as I do, I believe I have the majority of the educated scientific physicians of the world on my side.

I am called to see a patient in a hurry. I find his breathing scarcely perceptible, or perhaps hurried and labored; face blanched, pulse at the wrist almost gone, friends weeping around the bedside, those near and dear beseeching in the most plaintive tones, "Doctor, can you not help him? For God's sake do something to rouse him, that we may hear one more word." I immediately administer an hypodermic of brand yor whiskey, another and another, order the stimulant freely rubbed over the surface of the body; I work and work over my patient, placing my main hope in the stimulating effects of the alcohol, and at last my endeavors to restore consciousness are crowned with success. I order the alcohol continued in medicinal doses; I have carried my patient over or through the crisis; I have saved a human life. Now, this is no fancy picture. Every physician of any considerable experience has seen these things time and again, in pneumonia, in typhoid, and many other continued or exhaustive fevers. Could I have done anything without alcohol ? I say, no. You can talk about your other stimulants, ammonia, and this is perhaps the very best of them all, capsicum, peppermint, and so on, *ad libitum*, *ad infinitum*; you can not accomplish with any other drug known to medicine, what can be and is every day done with alcohol. I have a patient, a debilitated woman, perhaps, suffering with nervous exhaustion or from the effects of some chronic disease; she is tired from over-exertion, and comes to the table unable to eat; I order a small glass of some stimulating beverage, such as a little whiskey and water, or wine or beer; that stimulates the stomach to action, sharpens up the appetite, and she eats a comparatively hearty meal. This stimulant has done her good, not from the alcoholic mixture having had any special nutriment in itself, but it has helped the patient to eat, and aided the digestion of the food which was taken into the stomach.

I might go on and tell you many other useful things that alcohol is capable of doing when taken as a medicine, but time will not permit. In leaving this part of my subject, let me say, that in such diseases as consumption, unless in the last stages where there is no possibility of recovery, I do not believe in prescribing alcoholic stimulants to be taken habitually; I believe you will make a drunkard if you do; and escaping that, you will bring on some other disease quite as bad as the one you are trying to relieve. I verily believe that a great many consumptives die of stomach, liver or kidney troubles brought on by the taking of whiskey or other alcoholic beverages to relieve the existing disease.

Do not take alcohol to warm you when you are cold, for it won't do it.

Do not take it to cool you when you are hot, for it won't do it; although it is more apt to succeed in the latter case than in the former. And last, even when taken as a medicine, only take it when something is eaten with it, and only when ordered by a competent, honest physician.

NARCOTICS.

As to narcotics, I can say but little at this time, for my 20 minutes are nearly up. I shall only speak of a few, well known to the general public. It is a peculiar fact well known to the medical profession, that many of our most useful drugs are the most dangerous when not administered with care and skill. No narcotic of any kind should ever be taken unless prescribed by an educated person who knows what he is using, and what he is using it for. A lady patient of mine, once said to me, that she had made up her mind never to take anything to ease a severe pain, unless prescribed by her physician; for, said she, "if the pain is severe enough to require any dangerous drug to relieve it, it is severe enough to need a doctor to administer the remedy." This is a very good rule, and if carried out, there would be few opium and morphine eaters, or chloral *habituès*. The custom of people going to the drug stores and buying any of the pain relieving narcotics, is a pernicious and dangerous one; for it soon grows on the individual so that on the slightest little ache or pain, he will rush off and get the drug, not thinking or perhaps knowing that he is fast becoming a victim to a habit that will eventually drag him down to a level far beneath the veriest brute.

Opium is one of, if not the most useful drug in our whole materia medica; although some of our doctors profess to get along without its use, but if so, they use something else quite as dangerous and not half so efficient. It, like alcohol, occupies a position on the throne of the physician's or surgeon's armamentarium, from which for almost centuries, the prejudiced and ignorant have been trying to dislodge it, but with such success that today it occupies a position far above what it ever did before. I do not mean by this that more opium is used now in medicine than formerly, for I do not think that that is the case; but it is used far more intelligently and far more successfully as a curative agent, as well as a narcotic, than ever before. Opium in any form should be used only when absolutely necessary and usually, to relieve pain, and never, except in experienced hands. An opium *habituè* is worse, in my opinion, than a drunkard.

Chloral Hydrate.—Although there are other drugs trying hard to usurp the position held by this medicine, still it stands almost alone as a sure and safe hypnotic or sleep producer, when properly and intelligently used. Chloral is bought by the laity at drug stores, and sometimes we find victims of its abuse. Never buy and take chloral hydrate, for it is a dangerous drug in untutored hands; a small dose will sometimes prove fatal, and when habitually used, its victims become miserable creatures, neither of use to themselves nor to their fellow beings.

Bromide of potassium is less dangerous, though its effects when taken indiscriminately are deplorable; whereas, its good effects in those diseases for which it is used by the medical profession, are far-reaching and most satisfactory.

Tobacco I consider simply as a wasteful, dirty substance, sometimes useful in sickness, never necessary in health.

Antipyrin and antifebrin.—These I may say, are twin sisters and I

mention them particularly because they have jumped into prominence in the last year or two most marvelously; have done a great deal of good and a good deal of harm. With some patients they are, I believe, dangerous; with the great majority, perfectly harmless, when required and taken in anything like reasonable doses. A few deaths have been reported by their use; we have also had some deaths from drinking cold water within the same time, and some from eating beefsteak; with fifty times as many from eating ice cream and canned goods, and drinking lemonade. So that when we hear or read of a death that is supposed to have occurred from the use of a really useful, good thing, we must stop and consider whether it was used with intelligence and care, or whether the patient did not die from some other cause than from the use of the article or drug in question. I speak in this way on this matter, because frequently some person will either laud new things to the sky through ignorance, or condemn them from the same cause. Men or women are not necessarily illiterate because they are ignorant of the use of drugs, and they can not, I care not who they are, be competent to judge of any drug or combination of drugs, unless they are perfectly familiar with its constituents, uses and effects. A drug is not necessarily dangerous or useless simply because some individual who has had no experience with it and knows comparatively little about it or anything else, says so. When an assertion is made, the person making it should be able to substantiate it with positive proof, positive evidence that he knows what he is talking about. It is so easy to praise a thing from hearsay; so easy to condemn it through ignorance. I consider antifebrin one of the most valuable acquisitions to the materia medica in the present century, and I speak from the crucial test of a large practical experience.

Antipyrin in some cases is equally useful, but I think not so universally so; still, do not buy these drugs and use them indiscriminately. You would not think of taking a drink out of a bottle if you did not know its contents. It might kill you, and so might the little white sparkling powder you buy at the drug store labeled, "Antifebrin." But do not condemn the use of things you know nothing about, simply because some simple old fogy says they are dangerous or harmful. I believe that alcohol, opium, chloral, antipyrin, antifebrin, coffee, tea are all useful, almost indispensable, all compartively free from danger when properly used by people who have studied them and understand their true action on the human economy.

THE DRINK PROBLEM.

DISCUSSION BY HENRY F. LYSTER, A. M., M. D., MEMBER OF THE STATE BOARD OF HEALTH, DETROIT.

(Reporter's Abstract.)

This drink problem is a very important one, and I am very well pleased with the position that Professor Fall has taken in reference to it. The education of the people in any of these great matters is the best way to bring them about. We are not all to be enthusiasts who discuss the subject from a moral point of view, which is all right; but it is well to have some one appeal solely to the scientific point of view. I look upon this question of the drink problem as one of the most importance; and we need

the eloquence and the vim, the force and the feeling of these temperance enthusiasts, and also the burning words that men have uttered when they have seen the great disaster which the habit of intemperance produces in the country. Men who have seen whole countries swept of their population by this monster evil can not help using words that burn into the soul. But we must have the cool logic of science to offset these burning declarations.

It is the more ignorant classes of persons who stick to their drinks. It is the Russian peasant that drinks; and the lower classes are disposed to drink anything they can get. I often wonder who it is in America that drinks. We do have persons in America who drink because the statistics show that the amount of liquor drank is very large, twenty or thirty gallons, perhaps, to the individual. But there are persons in America who do not drink so much, particularly the women, who do not drink at all.

I think that it is a matter of education, to properly inform the people on this drink problem. I remember that in the early days the persons I met had no idea that alcohol was so injurious,—particularly that inviting drink, by the way, known as the cocktail, some of them taking the cocktail two or three times a day.

There are two classes of drinkers,—we have the spree drinker and the habitual tippler. Bad as the spree drinker is, the habitual tippler is worse. The spree drinker who drinks for three or four weeks at a time is a pretty hard case, but he does not damage himself very much unless he dies. I have known a spree drinker who put a glass of whiskey and a glass of water on the mantel and resolved that when he felt his thirst for drink coming on him he would quench it with the water. But instead, he would drink the water and go on with his debauch, and after a period of three or four months he would feel coming on him that power which made him go back and drink until he destroyed all his opportunities. I have seen these slaves to strong drink in my own practice, and know that they felt this power coming upon them, and they were utterly powerless to control it. It is burned into them like a mark of fire. I sympathize with these people, I pity them; they are unfortunate. It is very rare that a man gives up drinking after he has got into the habit. But the habitual tippler is the one who produces the permanent changes on the body, and he gets old very young.

It is a difficult thing to take strong drink in moderation, without being liable to get into the habit of tippling. Young men do not stop to think of the effects of alcohol upon the body, but they feel strong and lusty, full of animal life and spirits, and they like a good time, they like to be manly, and take a little beer or wine; they don't care anything about physiology; they are not in the reflective age. It is only after a person goes by thirty that he begins to realize the effects of alcohol upon the body. It is mainly because his attention is not called to it so much in youth. It is the older persons,—those who have gone by thirty years of age, who know with reference to these diseases caused from the excessive use of alcohol.

I don't believe that medical men think as much of alcohol as a medicine as they did some thirty years ago. It is wonderful what a change has come over the medical profession in reference to the use of alcohol as a medicine. However, there are cases where we very naturally give a little brandy, and there is no physician so much of a temperance advocate that he would refuse to give some stimulants, if stimulants are absolutely necessary, as in the later stages of typhoid fever, when you are cooling

the patient with a bath; and a little whisky punch with very aged persons is a good thing; it stimulates the heart and they sleep better.

But alcohol is not relied upon as a curative agent; we rely upon it mainly to tide the patient over in a fever. We find the patient is very low, and we give the alcohol to tide him over. There are other stimulants that are sometimes used, with equal if not greater advantage.

The alcoholic liquors are less regarded, less thought of today, than they were thirty-five years ago. It is a matter of education. This plan of educating our children in the schools is the way to make them understand the dangerous effects of alcoholic liquors upon the human system; but we want to bring all these different aids into use in the limitation of intemperance. It is one of the most important subjects in the country today, and it should have the support of the laboring classes.

CAN CONSUMPTION BE PREVENTED?

BY WM. E. ZIEGENFUSS, M. D., OF ALPENA, MICH.

Should the government of the United States enact a law, condemning to death every seventh person in the State of Michigan, or the United States, there would instantly go up such a protest as to amount to the greatest rebellion the world ever saw. We would be active day and night, and would not rest until such a government was overthrown.

When I say that actual experience has proved that one-seventh of all deaths are due to consumption, you can readily see the importance of this question.

When a case of small-pox is reported in Alpena, the city is alarmed, many inhabitants rush off to some safe retreat, and the outside world quarentines against us and our products. Many of you have a too vivid recolection of its ravages eighteen years ago when much of this city was a hospital.

When that much dreaded foe, yellow fever, invaded our fair southern land, and laid waste Memphis, Shreveport, and other cities, the cry for help was nobly responded to by the whole country, and the advent of "Jack frost" was hailed with hearts full of thankfulness, because then the germs of the disease would at least become inactive.

When the health officer stops next door to you and nails up a little pink card announcing "scarlet fever," the added caution, "no admittance," is scarcely necessary, for sad experience has taught many of you the importance of precaution.

But consumption is more deadly and more prevalent, and causes more deaths than all these diseases combined. A diagram, "Deaths in Michigan, 1876-87," graphically illustrating the relative number of deaths from these diseases in Michigan is printed on a subsequent page.

Where one dies of small-pox in Michigan forty or fifty die of consumption, the American "white plague." This State pays tribute to the disease annually at the rate of 3,500 souls, the nation contributes 150,000, and the whole civilized world about 5,000,000. This reduced to an average daily death-rate amounts to 10 for Michigan, 411 for the United States, and over 13,000 in the world.

When we take into consideration the fact that the disease is not subject to control to any great extent by either latitude or temperature; that it is

invading alike the homes of the peasants and the palaces of princes; beckoning the wretched Siberian convicts hence and slaying the first-born of many a home; cutting short the career of one-seventh of the inhabitants of almost every land; and that the disease has been so thoroughly studied and found to be subject to laws of sanitation almost as much as small-pox, the wonder is that so much of it exists today.

CAN THIS FORMIDABLE DISEASE BE MODERATED OR PREVENTED?

In order to give you an idea of how, or whether it can be prevented, the nature and principal causes must be studied.

Definition.—Dr. C. Theodore Williams of London, the leading authority on this subject says, in Quain's Dictionary of Medicine, it is a "disease characterized by a progressive wasting of the body; persistent cough, with expectoration of opaque matter and sometimes blood; loss of color and strength, shortness of breath; hectic fever, night sweats, and diarrhœa; these symptoms being associated with certain well-marked pathological changes in the lungs, namely, the formation of consolidations in a granular or diffuse form; which either undergo caseation and disintegration, leaving behind excavations in the lung tissue; or, becoming indurate and shrinking, cause contraction of the affected organ."

Causes.—Manget, in 1700, stated that in the dissection of a person who died of consumption, he discovered small nodes, or solid bodies, of the size of a millet seed in the lungs, liver, spleen and kidneys. These small bodies are now called miliary tubercles, wherever found. Stark, in 1785, gave a complete description of these tubercles, and Reid, in the same year, claimed that they were not enlarged lymphatic glands, but independent formations in the substance of the lungs.

Bayle and Laënnec in the early part of our century did much to elucidate this problem. Virchow has done much more than any of his predecessors to bring order out of the chaos of ideas. He believed in the infectious nature of tuberculosis.

Experiments have been made by introducing tuberculous matter into the lower animals for the purpose of determining whether they could be infected with the disease, and this with such success that, in 1864, Villemin expressed the belief that it was an independent disease, as much so as small-pox or scarlet fever, and could only be produced by the introduction of tuberculous matter into the lower animals, or from one animal to another.

The most eminent men of science exerted their utmost powers to disprove or to prove the new doctrine. The experiments made with tuberculous matter for the purpose of infecting other animals were by *inoculation, inhalation and feeding.*[1]*

Toussaint concluded from his experiments that no disease was more infectious than consumption. These experiments were made upon cows, goats, swine, rabbits and dogs, and almost invariably led to the development of tuberculosis. Zürn, in 1871, observed micrococci in the blood of a cow that died of consumption, and Chauveau made similar discoveries the following year, hence their belief that micrococci were the real cause of disease.

In March, 1882, Dr. Robert Koch, of the Imperial Board of Health of Germany, read a paper before the physiological society of Berlin, in

* See addenda.

which he detailed his experiments and conclusively proved the presence of the micro-organism, called *bacillus tuberculosis*, in every case of consumption, and furthermore that this microbe was the cause of the disease. It is hardly necessary that I should review all the facts existing to confirm the now generally accepted opinion, that the bacillus of Koch is the sole cause of tubercular processes. The foremost bacteriologists, pathologists and clinicians of the world have accepted this with a unanimity scarcely ever before or since witnessed in any scientific discovery.[2]

The bacillus is a rod-like organism, from 1-7000 to 1-12000 of an inch long, and about ¼ as wide as long.[3] This is surely microscopic. Koch has also shown that this microbe requires for its development a temperature of from 86° to 104° Fahr., for a period of at least two weeks, and this condition is only found in nature in the animal organism. An enlarged picture of the bacillus of consumption with some other micro-organisms, is shown on page 21 in a diagram illustrating Mr. Clark's article, following this.

Now what is this bacillus? Simply the doctors' name for the seed of consumption. Where is it found? This microscopic seed is found in the sputum and excreta of those affected with consumption. Dr. Williams says, "The sputum of two hundred consumptive patients at the Brompton hospital was examined and in only three did we fail to find the tubercle bacilli." Dr. Frank Donaldson, of Baltimore, in his address before the American Climatological Association said, "Tubercle bacillus is never present in sputa of non-tubercular disease, and observations have shown that bacilli are rarely present in the lungs when absent from the sputum. It may be safely said that all attempts to discredit the existence of these bacilli, or to assign to them inorganic properities, have entirely failed. We must now accept this particular micro-organism as a necessary factor in the causation of tuberculosis."

"Demet, Paraskeva and Zallonis, in Syra, Greece, had succeeded to their satisfaction in producing tuberculosis in rabbits by inoculating them with sputa and blood from a man sick with consumption, but they felt that the demonstration would be more complete and convincing, if they could operate on man himself. They therefore selected a patient who was suffering from gangrene in a toe, and whose death was inevitable because of his persistent refusal to allow the diseased member to be amputated. An examination showed that both lungs were perfectly sound, and that there was no tendency to tuberculosis. A quantity of sputa from a consumptive person was injected into the upper part of the left thigh. In three weeks there were evidences that the lungs were becoming diseased, and at the death of the man, in thirty-eight days, seventeen tubercles were found in the upper lobe of the right lung, and two in the left lung." *

This is the only case on record where the experiment has been purposely tried on man.

Now there are three ways by which this poison enters the system, viz.: By inoculation, by swallowing, and by inhaling it.

The dust scraped off the walls in rooms occupied by consumptives is known to be filled with millions of the bacilli, and capable of producing the disease. When we remember that Schill and Fischer have demonstrated that the bacilli retained their virulence for forty-three days in a moist putrefying sputum, but for 186 days when the sputum is dried in the air, the possibility of infection becomes apparent.

The consumptive walks our streets, occupies our churches, opera houses,

* Rep. Hatch Ex., Sta., Mass. Ag. College.

and railroad cars, frequents the postoffice, and is everywhere expectorating thousands, yes, millions of disease germs, to be dried and wafted on the air for us to inhale. "I do not desire to make you afraid to breathe, but to make you so dread the sputum of consumptives as to insist on its destruction."

It is not, by any means, true that all those that inhale the bacilli die of the disease usually produced by it. If this were the case the world would soon be depopulated. The fact that only one in seven who inhale the poison, dies from consumption ought not to militate against the belief of its infectious nature. The susceptibilities of individuals vary much. Some rarely take any disease, even after exposure; others on the slightest contact readily take it. (Just how or why this is so I cannot explain, unless upon Metchnikoff's theory, that there are particular cells which carry on the defensive action, and devour the intruders.)

Prevention.—To destroy all tubercular matter, or the germs therein, before it becomes dry and mingles with the dust we breathe, or to keep it in a state of moisture till the germ life is dead, fulfills every indication for prevention of infection by inhalation. But in the present state of society we can, however, hope only to approximate this. If our patients and their friends understand the danger we can secure their co-operation.

The sputa should be disinfected.[5] The best disinfectant I know of for this purpose is bi-chloride of mercury in the proportion of one part in 500. Use spit cups containing a solution of this disinfectant, or use paper or cloths which should be burned before becoming dry. The patient can do much to prevent infection by a strict observance of these precautions.

Those compelled to live under the same roof should be especially careful to have the air in the room pure by thorough ventilation; careful not to sleep in the same bed, or even in the same room, unless a large and well ventilated one. The well members of the family should go into the open air and fill the lungs with pure air to their full capacity, for a few minutes at a time, several times a day; they should eat the best of food and observe the best sanitary rules of life.

Can we eradicate the pre-disposition to the disease—that condition of the organism known to have weak resisting powers?[6] This is either *inherited* or *acquired*, but I cannot go into details, only to say that the inherited form we cannot hope to prevent, for it means the prevention of marriage, and the bearing of children, not only by the already affected but also by those predisposed to tubercular disease.

Our efforts must therefore be directed to the eradication of the acquired pre-disposition.

Dr. Trudeau's paper before the Amer. Climat. Asso., held in Baltimore, forcibly impresses the necessity of fresh air and plenty of it. In closing his valuable paper he says, "All means which tend to increase the vitality of the body cells have been found to be precisely those which are most effectual in combatting tuberculosis; one by one, specific methods of treatment, which for a season enjoyed popularity, have fallen into disuse, and hygiene, climate, and feeding,—in other words, a favorable environment —have alone given results which have stood the test of time."

There are a good many cases on record where persons have had consumption and recovered from it. Post mortems reveal this fact. Prof. Clark, who is to follow me, says, "Consumption never attacks wild oxen, but does, tame elephants and pet canaries. There is more consumption in cities than in the country, and Ziemssen says that imprisonment for 15

years is equivalent to a sentence of death by consumption." This proves the effect of environment upon the disease.

Let me offer a few suggestions concerning the baby born of consumptive parents. This should not be nursed by the mother. The presence of the disease in infants is in most cases due to the infection with the milk of a tuberculous mother, and not to hereditary predisposition, as is usually supposed. A healthy wet nurse should be obtained, or the baby should be fed on the artificial foods and cow's milk. Food should be given warm. Give the baby plenty of fresh air, sunshine, and warm clothing. It takes time and care, but the baby is worth the saving. Let it sleep as much as possible. Sleep is the period of greatest recuperation and at the same time the least waste of strength and tissue. Do not allow consumptives to infect the baby through that innocent practice of kissing it. Many a case of consumption has been produced in this way.

During the years of childhood and adolescence, guard well your child, encourage free exercise of mind and body. Keep the child busy, but avoid the pernicious over-stimulation of the schools of today. The atmosphere in many of our school rooms is impregnated not only by the respired air of their occupants, but also the emanations of cess-pools and closets under the building or in close proximity to the windows. Better give home instruction, or none at all, than years of living in dusty, poorly-ventilated and insufficiently lighted school rooms.

Many a bright girl has gone from the stage on graduation day, to her couch to meditate on the success of her years of study and anxiety, but also to steadily fail in strength and decline in health, and, with pallid face and hectic flush, linger a year or two and die,—die of consumption. Better far no diploma, no blue ribbon, no bright glare of stage light, no profusion of flowers, and no plaudits of friends and kindred; but in their place vigorous bodily training and proper hygienic surroundings which only can give promise of added years of life and usefulness.

All through life the children of parents predisposed to this disease must conform to a life least calculated to weaken and waste the constitution to open the way for a development of the disease.

Do not fail to attend to any pulmonary trouble,[7] catarrhal sore throat, or troublesome and debilitating cough. While these do not directly develop into consumption, they form the favorable soil for the multiplication of the deadly bacillus, the seed of the disease.

CONCLUSIONS.

1. The tubercle bacillus is the cause of consumption.
2. This bacillus is found most abundantly in the sputa of those having the disease.
3. It gains access to our lungs by inhalation and otherwise.[8]
4. Tuberculous meat and milk should be avoided.[9]
5. Sputa of consumptives should be disinfected, or burned before drying.
6. No person should sleep with a consumptive.
7. Clothing of consumptives should not be washed with other clothes.[10]
8. Cuspidors in hotels and other places should be partly filled with water, frequently washed and contents disinfected with a solution of bichloride of mercury.

7, 8 9, 10. These notes are on pages 18–19.

9. Sleep in well ventilated rooms, follow out-door employments, and avoid damp localities.

10. Heller says a consumptive may expectorate 7,200 million bacilli a day. Destroy these and consumption will cease.

Can it be done? The rapid advancement in sanitary reforms leads me to hope for a great reduction in the number of deaths from this disease.

That it can be absolutely prevented, can only be hoped for,—but much can be done in this direction by the intelligent co-operation of patient, nurse and physician.

NOTES AND ADDENDA.

(1) For a summary of the experiments relating to the communicability of tuberculous disease by inoculation, by the ingestion of tuberculous matter, and by its inhalation, the reader is referred to an article by Wm. P. Whitney, M. D., in the *Boston Medical and Surgical Journal*, July 28, 1881; to the article on *Tuberculosis* by Frederick C. Shattuck, M. D., in supplement to Ziemssen's Cyclopedia of the Practice of Medicine, 1881; to the Cartwright lectures by Wm. T. Belfield, M. D., *New York Medical Record*, February and March, 1883; and to an article by Surgeon George M. Sternberg, M. D., U. S. Army in the *American Journal of Medical Science*, January, 1885.

(2) For the details of Koch's researches see his report in the *Berliner Klinische Wochenschrift*, April 10, 1882; also, *Verhandlungen des Congresses für Innere Medicin*, Erster Congress gehalten zu Weisbaden, 20-22 April, 1882.

(3) "The tubercle bacillus is generally described as varying in length from $\frac{1}{8000}$ to $\frac{1}{12000}$ of an inch, and having a breadth of $\frac{1}{6}$ its length, or from $\frac{1}{4}$ to $\frac{1}{2}$ the diameter of a red corpuscle." Dr. Williams on *Consumption*, p 36.

"The tubercle bacilli are not as a rule, quite straight rods, they generally show slight breaks or bends, and often a gentle curve which may increase in the longest forms to such an extent as to reach the first stage of a cork-screw structure. This departure from the straight linear form is a point in which the tubercle bacilli differ from other bacteria which, like those shown in the photograph, resemble them very closely in size." *Dr. R. Koch.*

(4) The bacilli are very generally distributed. Dr. James E. Reeves, ex-president of the American Public Health Association, has clearly demonstrated the presence of these tubercle bacilli in sputum on the sidewalk, near the postoffice in Wheeling, W. Va. What occurred there might occur on the sidewalks of any city.

(5) Dr. Henry B. Baker, secretary Michigan State Board of Health, in a paper read before the Newport, R. I., meeting of the American Medical Association, entitled, "The Climatic Causation of Consumption" says: "These bacilli are present in the sputa of consumptives; and, although outside the body at ordinary low temperatures they do not multiply by reproduction, they are not destroyed by drying, and, consequently, in apartments occupied by consumptives who do not take care to so dispose of the sputa that they shall not become a part of the dust of the room, the dust may contain these bacilli, which are believed to be the specific cause of the disease."

(6) "As to the vexed question of hereditary tuberculosis, after what has just been said, I may express my opinion very briefly.

"There are no facts to prove the view that tubercle-bacilli may be present in the immature organism, either in the intra-uterine or extra-uterine state, without leading in a relatively short time to visible changes. Now tuberculosis is very rarely found in the fœtus and the newly born, hence we must conclude that the infective material comes into operation only exceptionally during intra-uterine life. * * * In my opinion hereditary tuberculosis is explained most naturally by supposing that the infective germ itself is not inherited, but rather certain peculiarities favorable to the development of germs which may later on come into contact with the body, in fact, it is the predisposition to tuberculosis which is inherited." *Dr. Robt. Koch.*

(7) In this age of precision in the diagnostic domain there is no longer any necessity for the physician to have a patient under observation a long time, and to make repeated examinations of the chest through auscultation and percussion to determine whether or not the person has consumption. This at best cannot be diagnosed through these means until too far advanced to effectively apply any remedial agencies. *It does not take long to cough and spit.* Examine this sputum for the bacillus with a good microscope. If present the diagnosis is conclusive of tuberculosis, while its absence invites further research. It may be present and be overlooked.

Dr. Koch says in his *Etiology of Tuberculosis*, "Not less important is it that the tubercle-bacilli furnish a criterion as to what shall in future be considered to belong to the domain of tuberculosis. In doubtful cases the diagnosis of tuberculosis will be made to depend on the demonstration of tubercle-bacilli. In practice this aid has already been extensively made use of, and that with perfect success." New Sydenham Society's transactions, 1886.

(8) Let me disclaim the idea that consumption is contagious the same as cholera, small-pox, and other acute or sporadic diseases, for of course that would be illogical and far from the fact. What I wish to show is the danger arising from the germs of the disease finding lodgment in a healthy system and, as time passes and circumstances favor the gradual development of the malady with all its attendant horrors, baffling the skill of the most learned physician and when firmly seated hastening the victim to an untimely end.

(9) The experiences of Foot, Kommercil, Lochmann and Chauveau all point to this.

(10) In a circular on precautions against consumption, published by the State Board of Health of Pennsylvania, the following advice is given:

"The duster, and especially that potent distributor of germs, the feather duster, should never be used in the room habitually occupied by a consumptive. The floor, woodwork, and furniture should be wiped with a damp cloth. The patient's clothing should be kept by itself, and thoroughly boiled when washed. It need hardly be said that the rooms should be ventilated as thoroughly as is consistent with the maintenance of a proper temperature."

THE PREVENTION OF CONSUMPTION.

DISCUSSION BY PROF. A. ARNOLD CLARK, LANSING, MICH.

Dr. Graves said many years ago that if we could find out just how to make a person consumptive, we would find the key to the prevention of the disease. So long as it was thought that insufficient food, lack of sleep, worry, broken hearts, hard colds, the irritating dust of factories and a dozen other things might cause consumption, its prevention was practically hopeless. But, as the speaker has told you, the dream of Dr. Graves has at last been realized, we now know the one thing which causes consumption—a little seed which causes this disease and nothing else, just as surely as thistles always produce thistles and nothing else, and all those other conditions which were supposed to cause the disease, it is now known, simply weaken the body and harrow the soil for the easier growth and multiplication of the seed.

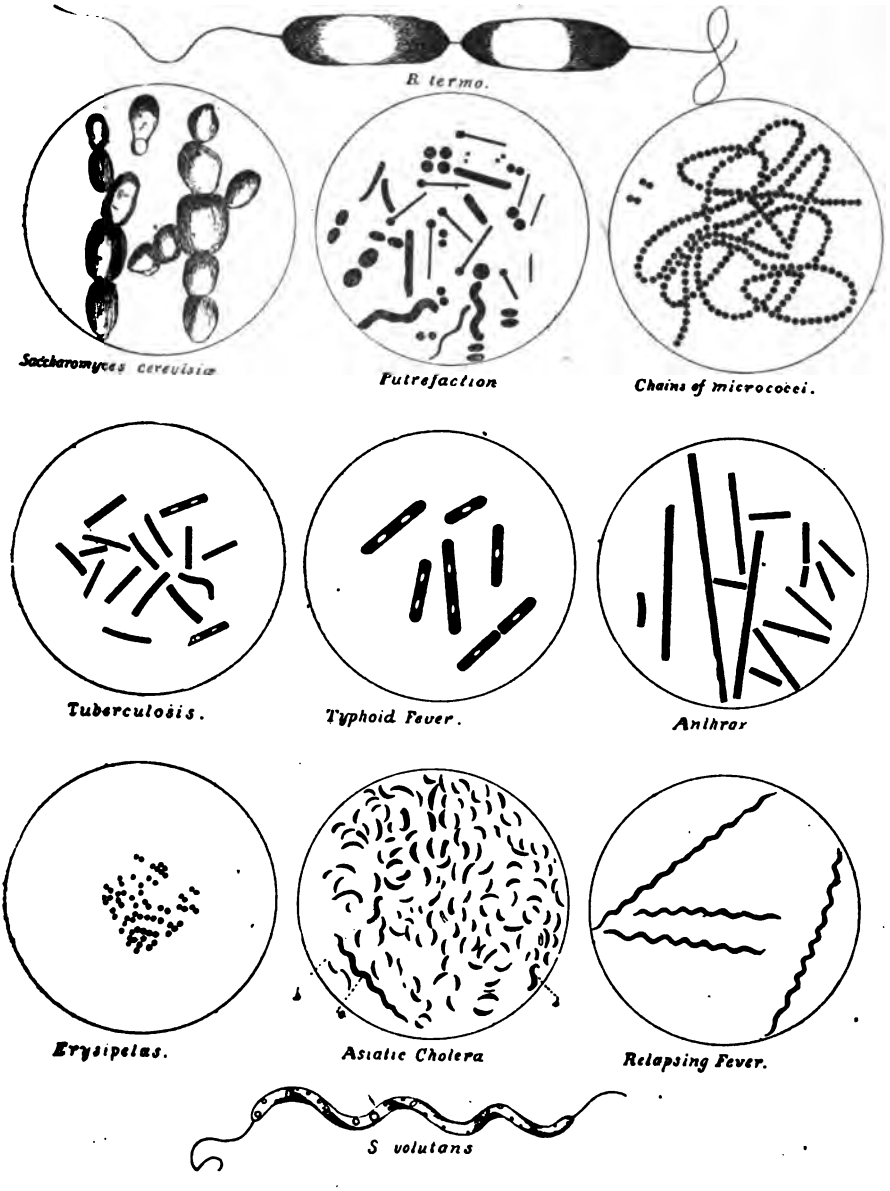
That you may see how this seed or germ looks, I have placed here this diagram containing pictures of the seeds or germs of a great many other diseases as well as this germ or seed of consumption.* You will notice that these germs have about as many different shapes as the short hand symbols which so bothered the brain of David Copperfield, but the germ of consumption is shaped like a rod and so it is called a bacillus, because that word means rod. It is called the bacillus tuberculosis because it causes tuberculosis or consumption. It is magnified very much here in order that you may see it. Really these germs are so small that three or four thousand placed end to end would not reach an inch. Or, to put it another way, if an ordinary match were magnified as much as these germs pictured here, it would stretch into the sky as far as Washington monument or the Eiffel tower.

Now, these little seeds invisible to the naked eye, reproduce like other seeds, and they can't arise out of nothing just because they are small. You have all seen mildew growing on linen. Now, mildew is the growth of a microscopic plant. If you could destroy all the little seeds of mildew there would be no mildew. You have all noticed a red mold forming at times on bread or other substances, and that red mold is the work of another kind of plant or germ. It is called the micrococcus prodigiosus. In this diagram † is a picture of this red mold growing on a potato. It is this germ in the air which causes the phenomenon of red rain. It also at times turns milk red. The superstition of the middle ages was loaded down with wonderful stories about the consecrated wafer. Wafers left out over night in damp places were found the next morning to be covered with this blood red mold. This was because the air was full of these little germs, and the blood red appearance was the work, not of spirits as they thought, but of micrococcus prodigiosus. So the germs of disease may be made to grow outside the body at the proper temperature on gelatine, potatoes or blood-serum.

You remember of reading in the book of Leviticus how, when the leprosy was in a house, it appeared in green and red streaks on the walls of the houses, and when such spots appeared, the house was to be torn down for it was infected. If the streaks were found on a woolen or linen garment it was the duty of the priest to burn the garment. Thus we see how the leprosy grew on garments just like mildew, and both indeed were

* The diagram is on page 21.
† Exhibited to the audience, but not here reproduced.

MICRO-ORGANISMS, SOME OF WHICH ARE BELIEVED TO BE THE SPECIFIC CAUSES OF DISEASES.



the growth of a microscopic plant. It is the work of modern science to isolate these germs and make them grow. And if we were to go to the laboratory of a biologist, we would find a large number of test-tubes in which different germs had been made to grow, and before you there is a picture of this bacillus of consumption as made to grow on gelatine.* Now, just as these germs will grow on gelatine, so they will grow in the human lungs. In order to produce these growths, the germs must be kept at the proper temperature; and the germs of consumption find in the human lungs the proper temperature. They find there, indeed, a regular hothouse for their growth and multiplication.

Consumption then is the growth of a given particular seed in a given particular soil.

Another point which we must get in mind is this: We can't get consumption without the seed, and if we could destroy all the seeds of consumption we would stamp out the disease, just as surely as we may stop our fruit fermenting by boiling it and thus destroying the germs of fermentation. In order to know how to stamp out the germs or seeds of consumption we must know where they are found. The germs of consumption are found in the cells of the lungs. They occur singly, in pairs and in bundles, and from the lungs of the consumptive they find their way to the lungs of a healthy person and there grow consumption.

Are these germs exhaled in the breath? If so, it would be necessary to shut up the consumptive from his friends and neighbors as in cases of small-pox, scarlet fever and diphtheria. But repeated experiments show that the germs of consumption are not carried in the breath. Bollinger caused a consumptive to breathe on a surface covered with glycerine, and he caught no germs. Grancher caused a consumptive to breath two hours a day for many days in an air-tight rubber bag containing guinea-pigs, and the guinea-pigs did not contract the disease.

Where are the germs to be found? The speaker has answered the question: They are expectorated in the sputa from the consumptive patient. These germs have been found repeatedly in the sputa, and animals inoculated with these germs have contracted the disease and died. These germs have even been found in the dust from walls of rooms inhabited by consumptives, where the sputa, drying upon the floor, had been carried by sweeping and dusting to the walls of the rooms,—still virulent, after being dried for several months. Schill and Fischer inoculated animals with sputa which had dried 126 days, and all contracted the disease. An Italian physician has found that, if dried and kept at a certain uniform temperature, these germs retain their virulence 9 or 10 months. Indeed these germs are not so dangerous while still moist because they are held together, but when the sputum dries, the seeds scatter wherever the wind blows them.

That consumption is spread in this way is no longer a matter of theory, but a matter of fact. The sputa from consumptives have repeatedly been pulverized, sprayed into a room, and animals, placed in the room and compelled to breathe the dust, have caught the disease and died. When Dr. Gautier was performing such experiments, he accidentally breathed the sputum dust and contracted the disease.

When Tappeiner was causing dogs to

BREATHE THE PULVERIZED SPUTA OF CONSUMPTIVES,

a robust servant of forty laughed at the idea that consumption could be

* Exhibited to the audience, but not here reproduced.

caught in this way. In spite of warnings he went into the inhaling room, breathed the sputum dust, and got the consumption just the same as the dogs. In fourteen weeks he died of consumption.

Thousands in Michigan every year do unconsciously just what this man did consciously and wilfully; and when we think of the ten thousand consumptives in Michigan who every hour in the day are expectorating along our streets and even on the floors of public buildings, postoffices, churches, hotels, railroad cars, and street cars, when we think how these germs are being dried and carried into the air by every passing breeze, by every sweeping, and how they are capable of producing the disease six months after drying, when we think of the miscellaneous crowd sleeping in hotel bed-rooms, when we think of the close, unventilated sleeping car with hangings and curtains so well calculated to catch the germs, and where, as some one has said, the air is as dangerous as in those boxes filled with pulverized sputa where dogs are placed for experiment; then when we remember that man's lungs are a regular hot-house for the growth and multiplication of these seeds of consumption, is it any wonder that one citizen in every seven dies of this disease?

Now, my friends, the object of my remarks is not to make you afraid to breathe. I suppose there is such a thing as dwelling on the dangers that surround us until we become morbid, like the Irishman who used to stand each day before a mirror and shut his eyes to see how he would look when he was dead. It made him melancholy. You know Mr. Talmage says that a great many people kill themselves worrying about sickness and about dying. He says they bother about their digestion until the stomach finally gets tired of being suspected so much, and says: "Hereafter make way with your own lobsters," and the mistrusted lungs resign their office, saying: "Hereafter blow your own bellows."

But if we talk about these invisible enemies in the air we breathe, it is because we know their military tactics, and how to destroy them, and why should we cry "Peace! peace! when there is no peace?" If this is an average Michigan audience, one person in every seven here tonight will die from this disease, and this is true, with slight variation, over the civilized world. Twenty citizens of Alpena will surrender their lives each year to this disease, 150,000 in the United States, 5,000,000 throughout the world. Yes; during the hour that I will stand upon this platform some seventeen men and women in the United States, men and women filled with happy, hopeful dreams—men and women to whom life is joy, will surrender their lives to this great white plague. And yet, if the recommendations of our State Board of Health were universally carried out we might stamp this dread disease out of our State.

What are those recommendations?

Under no circumstances should a consumptive be allowed to expectorate on the floor or street. Cuspidors used by consumptives, and cuspidors in public places should be partly filled with a disinfecting solution. When the consumptive is away from home and without access to a public cuspidor, what shall he do? Different forms of pocket spittoons have been suggested and I hold in my hand one called Dr. Dettweiler's pocket spit-cup. This cup is being manufactured and sold extensively in the United States, which is a good indication of the extent to which knowledge concerning the prevention of this disease has spread. Perhaps a paper envelope, containing only one expectoration, and to be burned on the first opportunity might be as good as this spit-cup. But under all circumstances all sputa from consumptives should be either disinfected or burned.

Not only does this mean the saving in our own State of 3,000 lives each year, but the consumptive should disinfect his sputa for his own good, because, if he continues to breathe the germs from his own sputa, he continually reinfects himself. Thus, he diminishes his chances of recovery, for it is now known that consumption is not incurable. Post mortem examination in cases of persons dying from other diseases show that many men and women are attacked by consumption at some time in life and afterwards recover. After the seeds begin to grow, capsules form about the little nodules, and the tubercular process stops, because the patient has such good food and air and healthy surroundings. So a person may keep his body so strong, and his lungs so healthy and vigorous that the seeds of this disease will never find there a congenial soil.

More important than all then,—let the consumptive see to it that he lives in sanitary surroundings, that he destroys every germ which comes from his lungs—for his own safety! For the safety of his wife and children!

This disease belongs to the great family of communicable diseases which are to be discussed tonight—those diseases which are caused by a germ, and spread from person to person. There should be laws guarding against these diseases. We should put a man in jail who spreads scarlet fever and diphtheria. The law should consider it a crime to kill your neighbor with small-pox—as great a crime as to knock him on the head at night. But for the prevention of this most dread of all diseases, we are as yet dependent entirely on the coöperation of the consumptive himself. Let us be thankful that there is usually no class of people more ready to meet their obligations as citizens and neighbors than those persons in a community suffering from this disease. For reasons already given, consumption singles out for its attack the intellectual, the hard-working, the sacrificing, the generous. It singles out the devoted wives and mothers, the hard-working husbands, who are ready to face bitter privations and endure exposure for the sake of those who are sacred and dear. It is to plead with such as these, to save such valuable lives as these that such conventions as this are held, and we naturally feel that this is as noble a work as ever engaged the attention of mankind.

Third Session, Friday, July 11, at 10 A. M.

SEWERAGE AND DRAINAGE OF ALPENA.

BY E. A. RICE, C. E., ALPENA, MICH.

The sewerage and drainage of a town or city, is a subject intimately connected with the health, happiness and longevity of the residents of such town or city. It is therefore, an essentially important and befitting question for a sanitary convention of the State Board of Health and citizens to consider. From the short time I have taken to prepare this paper I shall not satisfy myself, and I fear I shall not cover the ground as fully as might be expected by my hearers.

The subject which of necessity first occupied the attention of the residents

of the now flourishing city of Alpena, with its brick blocks and miles of paved streets, was the drainage of the surface water. This was undertaken and accomplished by the primitive open drain and box sewer, and later, salt glazed tile, so that where this city now stands (which was once, for the greater portion, an immense cedar swamp) an apparently dry soil exists. This work has made it possible to build up the city with good and substantial residences and business blocks. But has this drainage been accomplished in the most economical manner, or in a way to receive the full amount of benefit which should be derived from drainage?

Most of the drains were laid very carelessly, without any regard to a true grade. The depth of many was kept the same throughout by simply measuring from the surface of the ground a certain number of feet for the bottom of the drain, not taking into consideration the fact that there might be hills and hollows in the surface.

I have in mind one case where a box drain was laid under contract. The contractors were proceeding very expeditiously with the work, measuring very carefully from the surface of the ground (of course, it would not do to vary an inch in depth) for the bottom of their drain. After excavating through a sand ridge they encountered a low hollow or ravine filled with stagnant water, beyond was another sand ridge; here it seemed to occur to them that it would not do to keep the same depth through this low bog, as the water would not run off, besides they would have to labor in the water; so they constructed their box to clear the water. Inasmuch as this box had been ordered by the village for the express purpose of draining off stagnant water, it is difficult to imagine their motive. Perhaps they figured on the city employing a cheap hand to dip the water from the pond and empty it into the elevated box drain. Another case I think of, was where an eight-inch tile drain was laid on a main street with boxes to be used as man-holes built at short intervals. One of these man-holes was built in a hollow, so that after the drain was completed, the water naturally sought the lowest level and filled this man-hole. To remedy this defect another drain was constructed to convey the water from this man-hole away in another direction. In this way they succeeded in draining some of the water away; certainly not in the direction which they intended, but in the direction of the natural fall of the land.

These simple cases of which I have spoken (and there are dozens of others where the work has been performed in just as foolish and incompetent a manner), go to show the immense waste of money which can be effected by the corporation neglecting to employ a competent engineer to superintend and see that all work is carried on intelligently and to the best advantage. I will venture to say that if all the money which has been expended and wasted in draining this city from its first incorporation as a village up to the present time, had been used in a judicious manner under the direction of a competent engineer, this city of Alpena might boast as fine a system of sewerage as any in the State.

There are difficulties that must be surmounted in sewering and draining Alpena City, that are peculiar to this locality:

1. A large portion (probably six or eight hundred acres) of the area to be drained is but slightly above the level of the waters of Thunder Bay, the natural outlet of the drainage. For instance, the grade of State street is about six feet above the water level in Thunder Bay; Mill street

about six and a half feet.* Relative to the water level in Thunder Bay, I would state that it is gradually sinking. In the year 1881 it was over a foot higher than at the present writing. My opinion is that this settling of the water line is caused by the blasting and lowering of the channel by the Government in the St. Clair river for the passage of larger vessels. The taking away of the obstructions causes a larger flow of water, thus causing the waters of Lakes Huron, Michigan and Superior to be drawn down into Lake Erie.

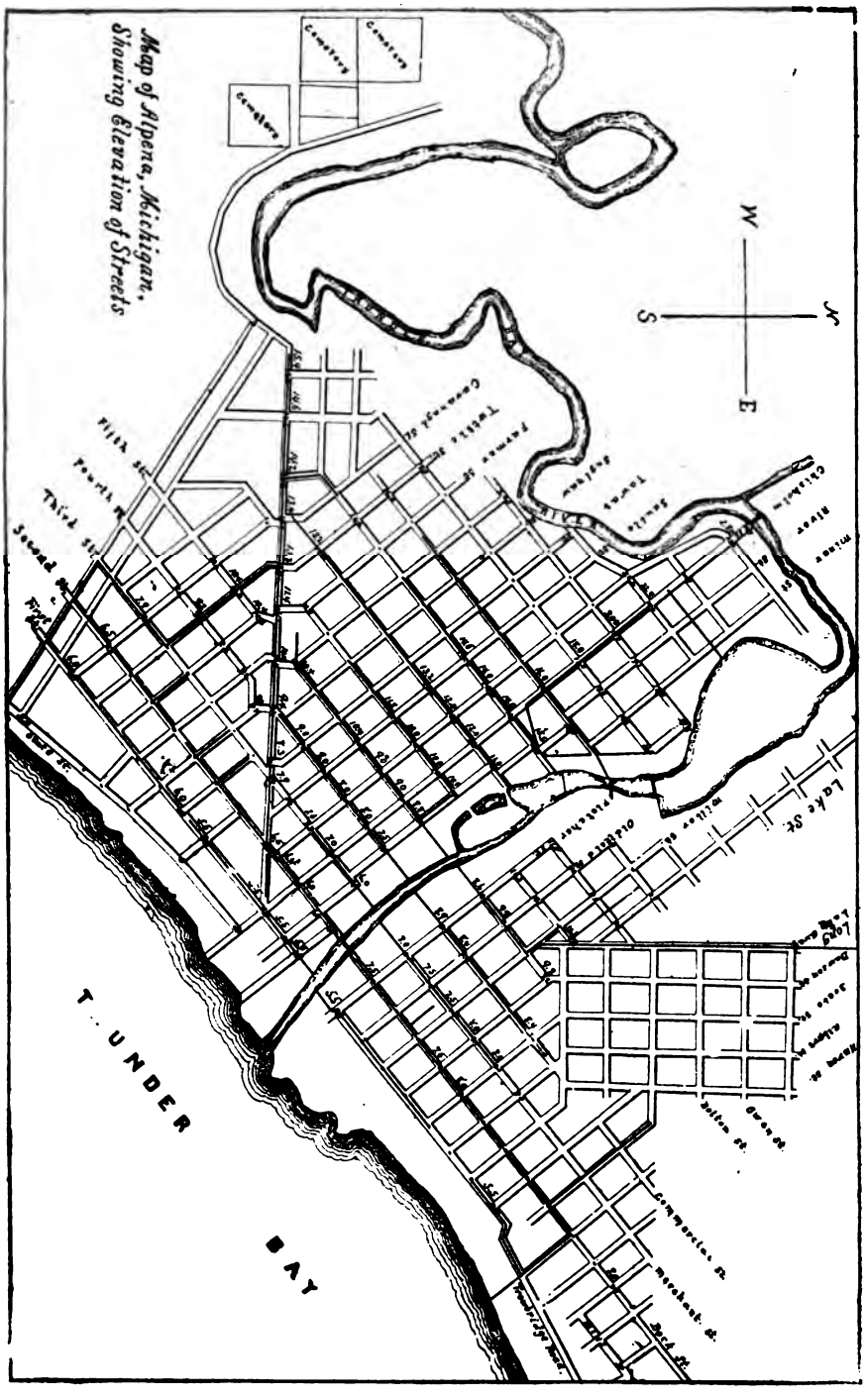
This slight elevation of the land above the outlet of sewers necessitates the laying of sewers very near the surface of the streets. We have 24-inch sewers on Second and Dock streets. Some of these tile have been unearthed by work on the streets, and it has been found that nearly every tile has been cracked by the shocks of travel and otherwise, so that they are liable to fall through at any time. Well built brick sewers are, in my opinion, the only remedy for this defect.

2. The character of the sub-soil must be taken into consideration in any scheme for the drainage of Alpena. This sub-soil is of quick sand, filled with water fed by springs. This water must be provided for and disposed of. How can this best be accomplished?

The principle of water carriage, as stated by J. W. Adams, chief engineer of the board of city works, and the consulting engineer to the board of health, Brooklyn, consists in the building of impermeable sewers or conduits so arranged as to remove the surface rainfall and the water-supply which is discharged to waste from the dwellings; but they should be so thoroughly constructed that the sewage shall in no case, be allowed to leak from the sewer to poison the sub-soil, but all the liquid being retained in the sewer is made an instrument in scouring out all solid matters and offensive substances of whatever kind which may have gained access to the sewer. Adams further says: That although the drainage of the sub-soil forms no part of the duty of the sewers proper, it is undeniable that, notwithstand all efforts to the contrary, the so-called impermeable sewers do, to a certain extent, drain the sub-soil from sub-soil waters. In some cases to a large extent, but more or less so in all. There is no difficulty whatever, in rendering a brick or pipe sewer water-tight, as it should be, and the trench will still permit a withdrawal of the sub-soil water without any further provision for it, providing it be not encountered in too great volume. But if springs of water occur in the sewer trench, provisions must be made for their removal which may usually be accomplished by simply laying the foundation of the sewer on broken stone; or, in case of considerable amounts of water, by bedding a pipe either of stone ware or cement laid with open joints, in broken stone beneath the foundation of the sewer pipe.

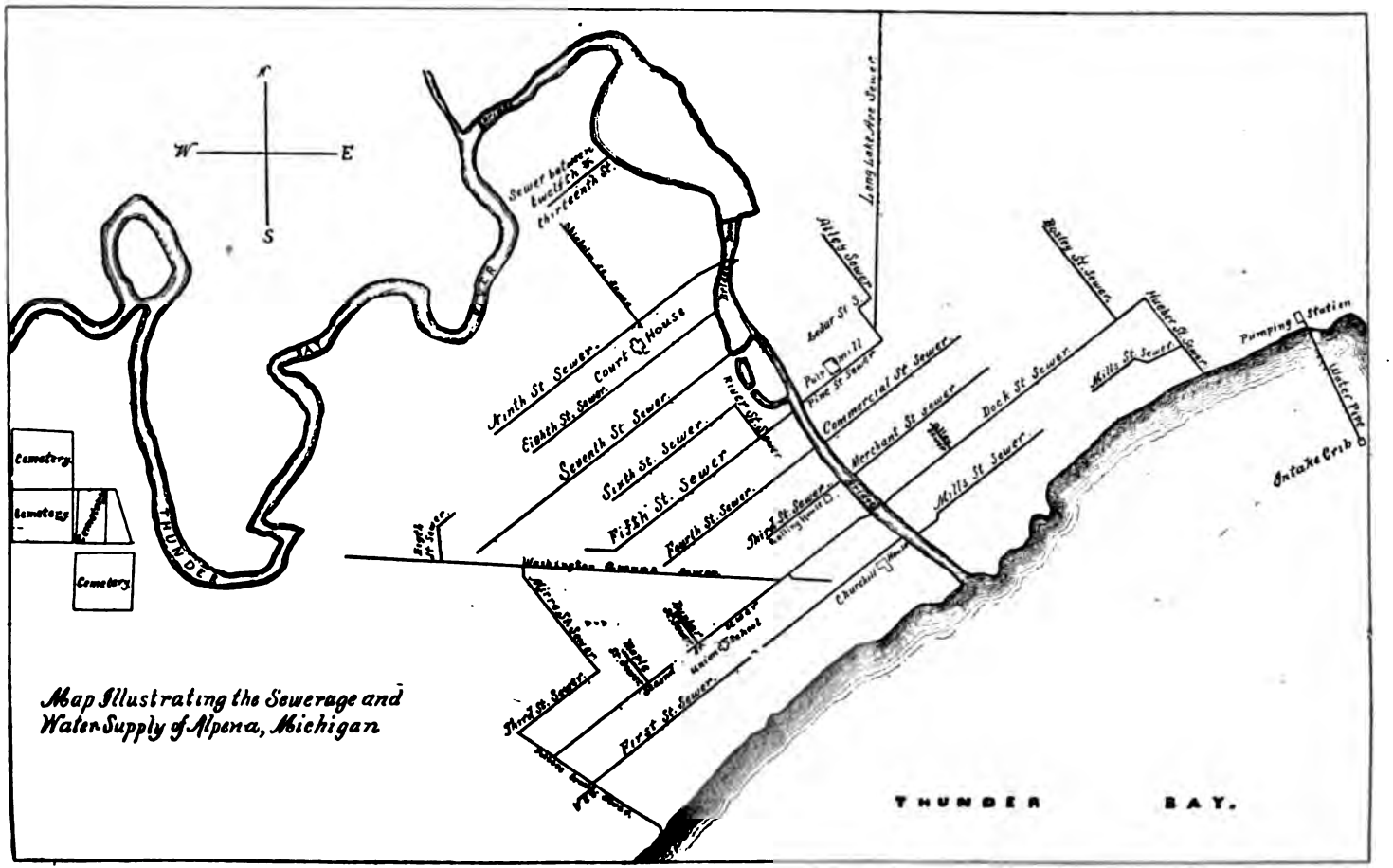
In Alpena, sewers have been laid of salt glazed sewer tile; the joints have not been cemented, but simply packed in around with wood shavings to allow the free entrance of the water with which the sub-soil is charged. These tiles are laid in quicksand without any other foundation whatever. The consequence has been that the tiles have become very uneven, settling in places and lifting in others, and in some localities to such an extent, that the pipe has been filled with sand and other refuse, so as to render the sewers worthless, and they would have to be relaid. Upon my appointment as city engineer, I insisted that all sewers should be laid on a foundation of boards in the form of a cradle. A drawing accompanying

* A map, exhibiting the elevation of the streets in Alpena, is printed on page 27.



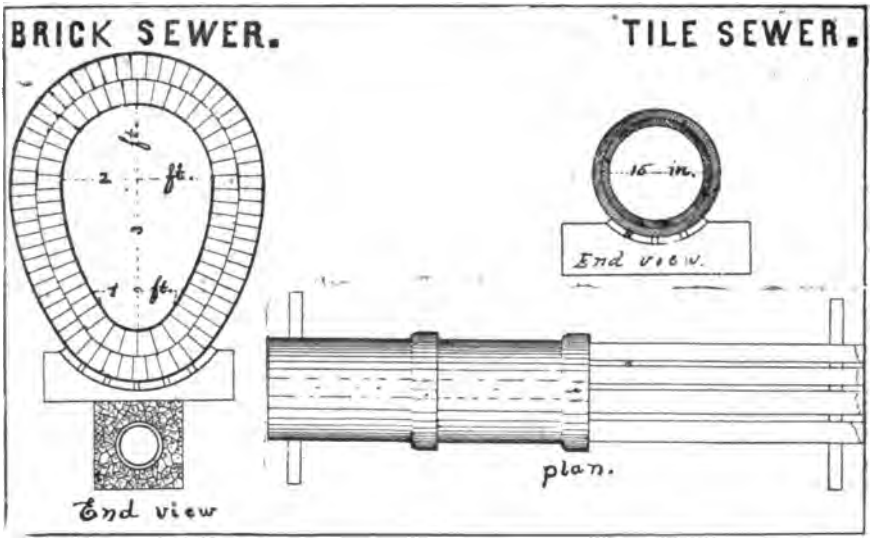
MAP OF ALPENA, MICH., EXHIBITING ELEVATION OF STREETS.

MAP ILLUSTRATING THE SEWERAGE AND WATER-SUPPLY OF ALPENA, MICHIGAN.



this paper shows the method of laying the pipe on this foundation.* All sewers laid in this manner have worked satisfactorily.

SEWER-CONSTRUCTION, ALPENA, MICHIGAN.



It is not my purpose to outline a complete plan for the sewering of this city, but simply to point out the defects in the present method, and suggest some points for improvement, in the hopes that a discussion in this convention will bring out points which will be of material help in promoting the health and welfare of this city as well as others in this State.

Accompanying this paper is a map giving the elevation of the grade of the streets.† From this map it can be readily seen in which direction all drains must flow. The greatest elevations are toward the northwest; from this it slopes gradually southeasterly toward Thunder Bay. The difficulty in obtaining a good outlet in Thunder Bay on account of the accumulation of silt, driftwood and other debris, makes it almost imperative to have the outlets in Thunder Bay river, in which case, the sewage will be carried into the bay instead of settling along the bay shore to prove a source of annoyance and danger to the inhabitants.‡

The amount of fall to be given sewers is an important matter. Adams gives a table for the amount of fall necessary to preserve circular sewers free from deposit provided they run half full, as follows: For six inch diameter, grade 1 in 60; for nine inch diameter, 1 in 90; for twelve inch diameter, 1 in 200; for fifteen inch, 1 in 250; for eighteen inch, 1 in 300; for twenty-four inch, 1 in 400; for thirty-six inch, 1 in 600; for forty-two inch, 1 in 700; for forty-eight inch, 1 in 800. The amount of fall to be given to sewers in Alpena is limited by the nature of the lay of the ground. This amount (from 5 to 8 feet per mile) is altogether too small to keep the bottom of the tile free from deposit, and some means of flushing must be resorted to.

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*The diagram is on this page.
†The map is on page 27.
‡A map, illustrating the sewerage and water-supply of Alpena, is printed on page 28.

It has been suggested, that sewers might be constructed at such a level as to take water from Thunder Bay river above the dam, at what is called the Water Mill, by gravity. A stream of water could, by this means, be kept continually running through the pipes during the dry season, which would be a cheap and effectual flushing arrangement. The difference in the elevation of the water level in the bay and river from a line of levels taken July 3, 1890, was twelve feet. This in a distance of one and one-quarter miles would give a fall of one foot in 550, or about two inches to 100 feet. This fall would be sufficient, when connected in this manner, to keep the pipes perfectly clear of all obstructions and no danger to the public health could possibly follow.

The size of sewers to be used depends on the amount of territory to be drained, the amount of the water-supply, the amount of the rainfall to be provided for, and the amount of fall that can be given the sewers.

In regard to the territory to be drained, the sewerage naturally divides itself into three parts, as follows: 1, the third ward; 2, the second ward and a small portion of the first ward; and 3, the greater portion of the first ward. For the first two systems a brick sewer, three feet high by two feet (greatest diameter) as shown by drawings, would be amply sufficient. For the third system, draining the greater portion of the first ward, a larger sewer would be necessary, as at present over 600 acres are tributary to that system. We have now a box drain 3x5, inside dimensions. At some future time it will be necessary to replace this box by a brick sewer of equal capacity.

The water supply in different cities varies, but where a good generous supply is furnished, about 60 gallons per capita is a fair average.

The amount of rainfall to be provided for, is generally estimated as one inch per hour for a large storm. One-half of this amount to reach the outlet in an hour.

The amount of fall to be given is regulated by the topography of the country, as before stated in this paper; sufficient fall can not be given to make the sewers self-cleansing at all times; some system of flushing must be used.

In conclusion, I will say that any plan for sewerage should conform as much as possible to the present sewerage; that is, a well considered plan should be adopted which will take advantage and make use of such sewers as are now in use. The larger tile sewers should be replaced by brick sewers. These brick sewers should be, for the most part, made egg-shaped with shall end down. All sewer tile should be laid with cement joints, and laid on a good, suitable foundation.

Storm water should be received in catch basins placed at street corners, and at such other places as may be found necessary.

Sub-soil waters, when found in large quantities, should be provided for by means of drain tile which can be laid in the same trench with the sewer pipe. Gas and water mains should not be allowed to interfere with the grade of sewers, and finally, all work should be in charge of a competent engineer.

SEWERAGE AND DRAINAGE OF ALPENA.

BY ARTHUR WILKINSON, M. D., OF ALPENA, MICH.

(Reporter's abstract.)

We speak of Alpena as being a delightful spot in which to live, but we are told that the chief corner stone of all cities is *health*. It is our duty to contribute all we can to make Alpena a desirable place to live.

What is sewerage? Briefly, a system for the removal of sewage; but what do we understand by sewage? Sanitary science tells us, it is all soiled waters and liquids, excreta and garbage. Our object is to learn how to dispose of that. Sanitation is not a new idea; in the early days, away back in the days of Moses, man stole his idea from the wild beast of the woods and adopted its methods of disposing of excreta, by burying it in the ground. Now, the sewage, garbage and excreta, if allowed to remain around our premises, will create poisonous gases which will enter the system and poison us; they prostrate the nervous system and destroy our vitality. So, it is incumbent upon all persons to try to dispose of this waste in the best possible way. The method that seems to take best is the water-carriage system, when it can be adopted. Alpena is situated in such a way that a system of water-carriage sewers as suggested by Mr. Rice could be used very effectively. The rain water is not sufficient to wash out the sewer pipes, and so the sewage when allowed to remain in the pipes creates a gas which enters the room in which you sleep and acts as a deadly poison. But by tapping the river at low water, we could get a fall of twelve feet, which would always give us a constant flow of water through the pipes, carrying out with it all the sewage.

In putting in two separate systems of sewerage it will cost a little more, but by so doing you can absolutely prevent the generation of gas, and it seems to me that Alpena could not be better situated for that purpose than it is, but there are some persons here who have had a good deal of experience in sanitary plumbing, and I will leave that part of my subject to them.

What is the system of disposing of this sewage, that now exists in this city? Most of you remember that when a man built him a house here, he made two holes in the ground, one for his well, and the other for the privy, usually not far apart, and the result was that the well, being the deeper, was naturally the receptacle of the drainage from the privy. That condition of things is not considered healthy now-a-days. Our present method of disposing of this waste material is imperfect, because the sewers are inadequate for disposing of it, and the solid matters remain and generate gas, and the result is that this gas finds its way back into the house.

There are a few people here who have put in a system of tile drainage, which system has not worked successfully, and I think that system should be discussed. These drains should be put in so that they could not possibly get out of order; they should be perfectly tight, so that no sewer gas could possibly get back to the house. Or if it comes back at all, the drain should be trapped so as to keep it from entering the house.

SEWERAGE AND DRAINAGE OF ALPENA.

DISCUSSION BY DR. HENRY F. LYSTER, MEMBER STATE BOARD OF HEALTH, OF DETROIT.

(Reporter's abstract).

The disposal of the sewage of a city is certainly a subject of the utmost importance. I see the drainage of Alpena is part of the topic—the sewerage and drainage of Alpena.

I am not very familiar with the topography of the city, but, from what I learned from the city engineer and the doctors since I came here, it is probably not a very difficult problem. You have the river above so that there is a fall of twelve feet between the river and the lake in a distance of two or three miles.

Some board should have control of the sewers; they should be laid out on some system that should not be changed by every change of officers.

The civil engineer should be consulted and the best method adopted. I don't think it is a good plan to have too large a sewer pipe. Two systems with smaller pipes would be decidedly better. The large sewers that were in vogue years ago in large cities have gone out. They carry the storm water and the sewage into the river; sometimes we hear that the plaster is all coming out and the water pouring out of them into the soil.

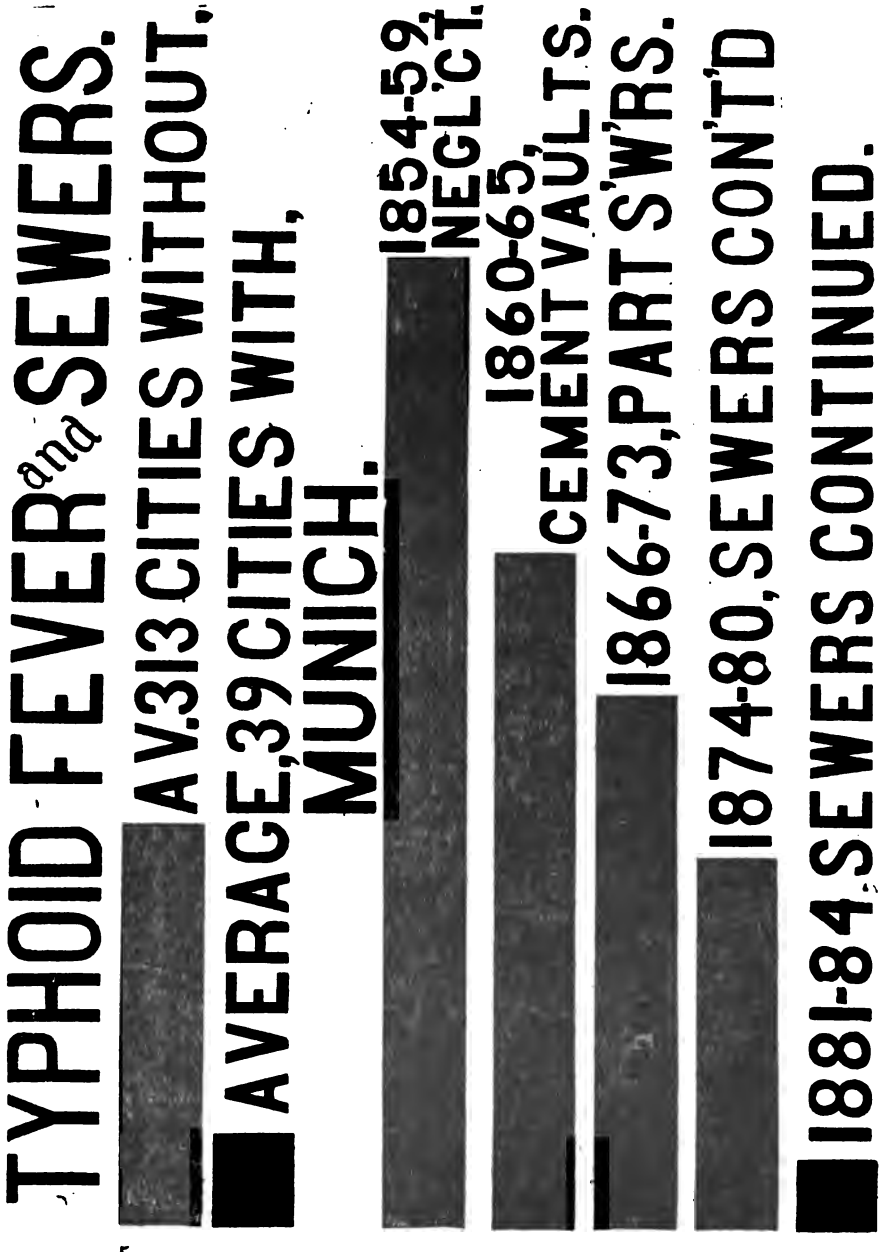
It would be a decidedly better plan to introduce the small sewers, having the largest of the ordinary street sewers only about six inches and the mains eight, and the grand mains not over twenty, those going from the streets into the yards and houses only four. The general idea of the sanitarian is to get rid of the poisons. The water-carriage system seems to be the best method of accomplishing this, though it seems unfortunate that we should carry all this sewage out into that beautiful lake; but Lake Huron is so large that it can take care of it. The river is a dirty body of water anyway, a natural sewer for all camps, etc., above you and is contaminated with earthy matters, and to make a sewer of the river is the most natural question here.

I think the expense of a double system of sewerage is not double the ordinary system; perhaps one and a half times as much as the old system. In a city like this where the lay of the land is rather peculiar, I should think the smaller system of sewers for carrying off the waste would be the one best adapted to it as they require but a slight amount of fall. Then they can be flushed by the river above you.

If the climate is mild there is no danger of the out-take pipe freezing up in the winter, but here, you might have severe winters and heavy snows. I should think it would be a very difficult problem to keep the pipes from freezing in winter unless you have the heavy snow to cover the ground. They should be well covered and protected from the frost. The theories of today which have been generally adopted by the people concerning these microbes and germs of disease have led us to pay more attention to the removal of all sewage. The old fashioned cess-pool was an abomination, was simply a slow process of poisoning the household; and the old fashioned well with its "moss covered bucket" today is considered very pernicious, and we are very particular now about the quality of the drinking-water, and the removal of poisonous matter. The cess-pool is

being done away with by the people; it belonged to the past age and is a source of contagion, and the time is fast coming when the last vault will be removed as far from the premises as possible.

I think you have, with the lake above you and the river going through the city a very excellent opportunity of removing this very fatal sewage poison.



SEWERAGE AND DRAINAGE OF ALPENA.

DISCUSSION BY DR. HENRY B. BAKER, SECRETARY, STATE BOARD OF HEALTH.

(Reporter's Abstract.)

I would like to exhibit a diagram which will show to the eye some of the facts alluded to by those who have preceded me.* Each one has mentioned the danger of the storage system, and I have here a diagram illustrating the danger of the storage system, which I would like to have you look at. The top line represents the average mortality in 313 cities without sewers; this is the mortality from one disease, typhoid fever—this being the one disease which is most of all spread by means of the storage system. The next line shows the average annual death-rate in 39 cities with efficient sewerage. Now the reduction in death-rate in typhoid fever is very marked by the introduction of sewers, but it is not fair to claim that it is all due to the sewers, for it depends somewhat on the water-supply. It is also partly due to the purity of the water that is obtained from the general water-supply as well as to the purity of that from the wells that are used. The top line represents the rate *without* sewers, the next line the rate *with* sewers, and these lines are accurately drawn to scale.

Now the lower half of the diagram refers to a single city. This upper line represents the rate of mortality from typhoid fever in the city of Munich, when they depended largely upon wells for their water-supply.

In 1860 they passed resolutions requiring the cementing of the vaults, and you will notice that the reduction in the death-rate is very marked. In 1866-73 they commenced a system of sewers, and in 1874-80 the sewers were continued, and the reduction continues. In the lower line is seen the mortality from that disease at the present time; it is only 1.4 per 10,000 inhabitants. That is, it was about 17 times as great in the old way as the new. I simply present this as supplying a material aid to you in considering the facts that have been presented through the papers and discussions of this topic.

ALPENA—ITS PAST AND PRESENT HYGIENIC CONDITION.

BY A. L. SEAMAN, M. D., ALPENA, MICH.

Twenty years ago when I first commenced my professional career in Alpena, the hygienic surroundings of the town were not good. Situated as we are upon the banks of Lake Huron, at an elevation of several hundred feet above Bay City and the Saginaw valley, almost a connecting link between the upper and lower peninsulas, with an abundance of ozone in the atmosphere, the professional man taking a hasty glance at all the elements surrounding the town at that time, would consider, from his superficial knowledge, that this must surely be one of the most healthy places in the State; but such was not the case.

Our water for drinking purposes and domestic uses was drawn from surface wells. You had only to dig down about three feet below the surface and you could have an abundance of water,—contaminated with decaying vegetable matter and animalculæ. It is true some few of the people had filters

* Diagram is on page 81

and cisterns, but the majority drank the water from surface wells. I came here about the first of May. The first case I was called to see was one of bilious typhoid fever, which yielded readily to treatment; but, as the season wore on, we had more cases, both in children and adults, and of a more malignant form, complicated with diarrhœa and disentery, until I had twenty cases of fever on my visiting list. Strangers that came here from Canada and elsewhere to work in the mills and on the river were invariably seized with diarrhœa after they had been here a week or ten days. It would continue with some for two or three weeks, notwithstanding the most active treatment. I used to advise my patients to drink nothing but water that had been boiled, or cold tea or coffee. I looked upon the diarrhœa as an effort of nature to throw off the poison that had been taken up in the system from impure drinking water. I noticed those who had an attack of diarrhœa at the commencement would likely escape the fever; so I took the cue that nature was pointing out to me in the treatment of my cases. We at that time had 2,700 people in the town and surrounding country; five physicians, and we were all, at times, busy. After September the fever abated both in the number of cases and severity. Hygiene, twenty years ago, played but a small part in the treatment of fever. Physicians had a somewhat hazy and misty idea of hygiene, and did not consider that typhoid fever, scarlet fever, diphtheria and measles should be isolated. The minds of the ordinary physicians were not quickened to the great value of sanitation in the prevention of disease, twenty years ago, as it has been in these late years, thanks to such conventions as this, in different parts of the State.

In 1872-3 we had a severe visitation of small-pox. The first case was imported from Port Huron. I was called to see the case, and, at once, pronounced it varioloid. It was summer time, the case was mild. I reported it to the mayor of the city. At that time we had no city physician or board of health; our city government had only lately been organized. Another family lived in the house; the mayor sent another physician to investigate and report his opinion of the case. He told the mayor that he thought that I was mistaken, and that the case was simply one of chicken-pox; but that did not convince me in the least. I kept my eyes open for further developments, and they came with a vengeance later on. A german girl employed by the other family was in the habit of coming in the room to see the sick man, and carried it to her family across the river. She and some five others were taken down with the disease; but it proved of a mild type and no deaths occurred. It was genial summer weather, such as we have in August and September. The authorities took hardly any notice of the disease. No measures were inaugurated to prevent the spread of the disease; no general vaccination of the inhabitants was ordered either as a preventive or to lighten the ravages of the contagion. As the season advanced, and the weather became colder, sporadic cases began to develop in different parts of the city. There is no disease that I am acquainted with that is so much influenced as variola by seasonal change. In the month of November I had several patients down with the disease; reported my cases to the authorities, but no notice was taken of my appeal. Other physicians differed from me in my opinion. The people became divided, some contending that it was the small-pox, and others that it was not. Dr. Maiden, one of our oldest and most experienced physicians, was not here at the time. Dr. Wilkinson at once pronounced it variola. He and I were agreed upon that point. The other

physicians contended that it was not; but they would not tell us what they thought it was. No wonder the laity were divided in opinion when the doctors disagreed. But after several deaths had occurred, and the rate of mortality had become as high as five or six a day and twenty or thirty of the people were down with the dread disease, the whole people became *sure* that it was certainly small-pox; and our city government was convinced by the stern reality of the facts before them. To say that a panic seized the inhabitants is a mild way of putting it. A board of health was established at once; a pest house provided; a physician and nurses put in charge; and sanitary and hygienic measures adopted.

After four months of continual effort, the disease was stamped out at a cost to the city and county of about twenty thousand dollars, where one thousand dollars would have been sufficient, if it had been rightly expended in preventive and hygienic precautions at the commencement. But since that time, we have had no epidemic of contagious or infectious diseases of any kind. We have had a few cases of scarlet fever, a few sporadic cases of diphtheria and measles, typhoid fever rarely, and bilious fever has been reduced to the minimum.

Our water is brought from Lake Huron for drinking and domestic purposes; so at the present time, we have one of the most healthful cities in the whole country. Taking the number of inhabitants at fifteen thousand, which we claim, and which this year's national census will give us, I contend that we have the lowest rate of mortality of any city in the State, or the whole country at large. How can it be otherwise? We have at times here, the bracing atmosphere and breezes from the lake, or the wind from the land, laden with the perfume of the balsam and pine. Pneumonia and diseases of the bronchi are rare with us, much more so than with older communities. Our population is increasing fast; not so much by immigration as by natural progression, which goes to show our healthy sanitary condition. We have nothing like the rate of infant mortality that we had some years ago. Although our present sanitary condition is good compared with what it has been in the past, much yet remains to be done by the board of health and the citizens, to make this an ideal city. But as it is, we are healthy and progressive; full of lusty life, not an ancient or modern Arcadia where every prospect pleases and man alone is vile, or content to rest,—but looking with fond anticipations to the future. When along the noble lake that bounds our city on one side, and along the banks of our river that pierces our city through the center (which is an excellent conduit to carry all our sewage out into the lake) we shall have a city of fifty thousand inhabitants; we have all the material advantages close at hand of the forests and a virgin soil that will respond with abundance to the toil of the worker.

These material resources can be seen at a glance. We have the best harbor on the chain of lakes, where the whole American and British navy could lie safely at anchor. It is no chimerical idea for us who have been here for a score of years and more, who have watched the city grow up from a small hamlet of a few scattered houses to the size and importance of our city at the present time, to claim that in the near future we shall be, as nature destined us to be, the metropolitan city of northern Michigan.

In our surroundings, we have no miasmatic swamps or stagnant pools of water, such as they have in the south and west, to poison the atmosphere with their noisome vapors; no fever and ague to chill the marrow of our bones; no endemic fevers peculiar to the locality, or climating fevers, as

they say down south. We invite immigration. We have to use no false inducements, or highly wrought pictures to excite the imagination, or lure on the unwary to their misery and destruction, such as has been done, and is being done by other places. We have pure air and water, health and prosperity to the saving and industrious,—all essentials to those who wish to enjoy life in its fullest measure, who are not yet imbued with that doctrine, that, "life is not worth living."

Physicians here are not getting rich or prosperous, and lawyers only moderately so,—great gain to the other people who live here.

And now, gentlemen, in conclusion, I but voice the sentiment of the medical profession and the whole people, that you are doubly welcome. This is the first time that we have ever had a sanitary convention, or a representative medical society in our youthful city, and I, for one, hope that it will not be the last. The subject we have before us, is one of great moment, not only to our own country, but to the whole world at large. It is bounded by no State lines or national boundaries. Other sciences have occupied the attention of the world for hundreds of years, such as geology and astronomy. They have their great names to boast of, such as Agassiz, Lyell, Hunt and Dawson among geologists, and Herschel, Newton, Laplace and the late Professor Watson, once of our own State University, among astronomers. But the science of Hygiene and Sanitation is yet only in its infancy. It is only arising above the horizon of doubt and prejudice; its sun will be a long time in attaining to its zenith; it is a broad and comprehensive subject; it is of vast importance to the health and welfare of the whole human race, and to the animals of the lower order; and as a factor in the accumulation of wealth, and a right and reasonable way of living, its benefits are incalculable. We have investigators, such as Pasteur and others who, in experimental deductions, of the germ theory have placed it upon a solid and lasting basis, that will give to the medical practitioner of the future a lever that he can use in a most advantageous way in the treatment of his patients. This theory has pointed out to physicians in our cities, towns and villages, the source and origin of epidemic diseases when they have arisen, and shown that they could be controlled and stamped out by human agencies not dreamed of by our predecessors.

DISPOSAL OF WASTE AND EXCRETA IN ALPENA BY SEWERAGE AND OTHERWISE.

BY W. A. SECRIST, M. D., ALPENA, MICHIGAN.

The subject assigned me by the committee, while not a pleasing one to contemplate, is, nevertheless, one of vital importance to the health and happiness of the people of our thriving, industrious and beautiful city. We who are citizens of Alpena, feel a just and laudable pride, in the city we have chosen as our home, and with that pride point to all the various advantages, both natural and acquired, which she possesses. We dwell with pleasure on her features of beauty, and hold up to emulation the enterprise and philanthropy of her citizens. While much is being done to develop her natural resources, to enhance her beauty and to assign to her the position she naturally deserves among cities of her population, both as a place of residence and of commercial and manufacturing pursuits,

would it not be well to pause for a moment and take into account her defects from a sanitary stand-point?

Alpena is perhaps as healthful as almost any city of her size, yet in our humble opinion, there is room for great improvement that would still tend to reduce the present rate of mortality. Since the first meeting of our committee, I have taken occasion to observe the condition of the city, with reference to waste and garbage of various sorts. I have also taken glances at the condition of our suburbs. I assume that it is generally understood that the decomposition of waste affords a fertile sphere in which disease germs originate and flourish and that the effluvia arising from decaying matter attracts flies to collect and carry about the germs. Hence I will not enter into a discussion of this part of the subject. While the back yards of most of our residences are scrupulously neat and clean we find many that serve as receptacles for all manner of culinary offal, slops, ashes, chips, tin cans, etc.

This condition might be easily obviated. All solid waste from the kitchen can be easily disposed of by burning in the kitchen range or stove as it accumulates. Care should be exercised in keeping crusts of bread, fruit and potato parings, bits of meat and bones, etc., separate from slops and dish-water. If thus kept separate, the solid waste that accumulates in preparing a meal, can be disposed of in the fire used for cooking. The slops and wash-water can perhaps be best disposed of by being thrown into the sewer. But in case there is no sewer connection with the house, it is best to avoid throwing them into depressions near the house, or in one place continuously. Better throw them on elevations, or on one place on the lot one day, and on another the next and thus avoid open cesspools. The practice of allowing slops, composed of dish-water, bread, fruit, meat, etc., to accumulate in pails or barrels on the premises, cannot be to severely condemned. During the summer months, these ferment quite readily and a most noxious, sickening odor is the result, and the slops are then unfit to feed to hogs or any animal that could eat them. Chips and bits of bark that are mixed with sawdust and earth, if allowed to accumulate, become damp and moldy and decayed. They not only present a bad appearance, but are productive of unwholesome odors and become dangerous to health. They should be raked up, dried and burned as they accumulate. Ashes may be kept in barrels, and be disposed of to farmers, who use them on their farms, and in small quantities may be utilized as we shall advise further on. Tin cans, while they may not be specially dangerous to health; certainly look badly and are a nuisance of no small magnitude, as we shall see when we come to look at the condition of our suburbs. The cans should be buried and not carted off onto our neighbor's grounds, as he will probably have no use for them. Then too, we have the refuse from stores, such as spoiled fruits, vegetables, etc., to contend with. These are usually thrown into boxes, barrels or into alleys or back lots, little by little, until they decay and give forth disagreeable odors and poison the atmosphere to a greater or less extent. Or they are carted off to the suburbs, and thrown into heaps with old barrels, old boards, boxes, tin cans, spoiled meats and fish, dead horses, hogs, cats and dogs.

This conglomeration of decaying matter, presents a most disgusting and sickening aspect. The air is poisoned by the foul decaying mass, and the horrible, dangerous stench is often wafted citywards by the wind. These things suggest the necessity of a garbage furnace for the disposal of such a mass of corruption, or the necessity of compelling parties to bury

dead animals, or anything else that might become offensive, or dangerous to the public health. I think that cremating would be the safer and most desirable way of disposing of these things, and, until arrangements can be made for disposing of garbage, much might be done to abate the nuisance by seeing that the laws relative to such matters are rigorously enforced.

Nature has done much for Alpena, by way of beautiful grounds and groves that might, by a very little labor, be made exceedingly pleasant resorts, where families might enjoy a quiet picnic day, and be thus the better qualified for days of toil and business cares. But, as it is, we must hire a rig to drive us out beyond these grounds, that we might walk to, if it were not for these nuisances. This desecration of the suburbs is an abomination that cries out for redress and should engage the attention of our board of health and all others interested in the general welfare of the city and the health of the citizens.

The disposal of excreta is a question that is eliciting much discussion in the city at the present. Our present system is certainly very faulty, and, as far as many buildings are concerned, is no system at all. While many of our private residences, hotels and offices are supplied with the water-carriage system, hundreds of houses, and many shops and schools, have nothing but the ordinary vaults, where the foul mass is allowed to ferment and decay and spread the seeds of disease and death throughout the city. It seems to me that the object to be obtained in this matter is a system by which we can get rid of effete material quickly, conveniently, safely and without odor. This certainly cannot be done if the vault is permitted to remain. Much however might be done by way of reducing danger, by using disinfectants, dry earth or coal ashes; a solution of copperas is said to be a good disinfectant for vaults; also chloride of lime. Better than vaults, would be the dry-earth closet, in which a drawer is used above ground and each dejection is covered with dry earth or coal ashes and the drawer emptied once or twice a month. This system, however, lacks convenience, is not entirely odorless and its safety is questionable. The dry-earth closet should have the preference over the vault, when connection with the sewer cannot be had.

The water-carriage system seems to me to possess the fewest faults and most merit of any with which I am familiar. It certainly comes nearest to fulfilling the necessary requirements. It carries off the effete material quickly and conveniently, and, if the closet is properly constructed, with proper traps and properly ventilated,—safely and without odor. Some objections urged against the water-carriage system for Alpena, are the escape of sewer gas into the buildings in which closets are located, the lack of necessary fall from some portion of the city to the river, the pollution of the soil owing to the condition of our sewers, thus interfering with a pure water-supply. Sewer gas can be effectually prevented from entering buildings through closets or bath traps by ventilating the traps.

It seems that we have sufficient fall for a good system of sewerage. But if not, this could be remedied by building a subterranean cistern, of sufficient dimensions, into which sewers could empty and from which the sewage could be pumped through an outlet pipe leading out from near the top of the cistern to the river.

With reference to any interference with the purity of our water-supply, we are told that the current of the river is to the right as it empties into the bay, and that would carry any objectionable substances far below the

site of our water-supply. So, from what information I have been able to gather with reference to this subject, I believe the water-carriage system to be the best system for Alpena.

We also have the dejections, sputa, etc., of the sick to dispose of. This deserves special care in cases of typhoid fever and other malignant diseases. Carelessness in disposing of the excreta in cases of typhoid fever may give rise to a wide-spread epidemic of that disease and result in great loss of life. All vessels, cuspidors, etc., used in the sick-room, should be kept scrupulously clean and be carefully disinfected. The excreta should be burned or disinfected and then buried, or disposed of by way of the sewer. In all cases of sickness and especially in contageous diseases where desquamation follows, the clothing and bedding of the patient should be subjected to a high degree of temperature not lower than the boiling point. Much can be done to prevent the spread of disease by paying strict attention to properly disinfecting all the excreta and by the observance of strict cleanliness.

The system of disposing of excreta, known as the Smead "Dry-Closet system," has been freely discussed within the past two weeks. There seems to be some doubt in the minds of those who have investigated it, as to its safety. We know that vaults in outside buildings are objectionable, and the idea of a vault under our buildings may prejudice us against the system. It is claimed by the Smead Company that the matter deposited in the vault is dried, and that decomposition is thus arrested, and the mass rendered innocuous. If this be true, what becomes of the moisture? As we understand it, the air from the rooms passes over the mass and is carried out by the air chambers. If the wind be moving at considerable velocity, the odor and germs will be carried away. If not, they settle down in the vicinity and create such a dangerous state of affairs as occurred in Cleveland, Ohio, not long since. Then, too, dry germs are more dangerous than wet ones.

We have seen but one of these closets in operation. We allude to the one in the Jefferson school, in the third ward in this city. In this one the hottest air that passes over the excrement, is that from the school room above and is certainly of too low a temperature to destroy germs. Experience in this one shows that the mass is but little changed, perhaps somewhat dryer than in the old vault system. But the odor remains, and fermentation goes on to a greater or less extent, with nothing to destroy the disease germs. The only hope seems to be that the wind will carry them off. We know from personal knowledge, and from individuals who have worked in the basement of the Jefferson school, that the odors from the dry closet, as used there, are, to say the least, disgusting. Pass by the building some quiet, warm, damp evening, when the wind blows from the building toward you, and you will agree with me that the Smead dry-closet is not perfection, or the most elegant arrangement for its purpose in the city.

They talk of cremating the excreta where it lies by first sprinkling sulphur over it. In this one, we fail to see how this can be done without cremating the building, which we think would be a rather expensive expedient. We learn that it is proposed to have a hot-air pipe, the temperature of which shall not be less than a hundred degrees, passing under the ledge or platform that receives the excreta, and thus hasten the drying process. It is well known that a temperature of a hundred degrees is the

most favorable for the development of germs. So we see no advantage in the hot-air pipe.

Another objection is that, if the fire in the furnace should run low or doors or windows be left open, there is nothing to prevent a reverse current and the foul odors would be wafted upwards into the rooms. Then, too, to keep up sufficient fire to heat the excreta sufficiently to prevent fermentation and destroy disease germs during the summer months, would certainly render the atmosphere of the rooms too hot for health or comfort. I understand that a second Smead apparatus is to be put in operation in our city. We may then have further opportunity to investigate its working,—perhaps when we would wish the opportunity were not present.

DISEASES OF THE TEETH AND THEIR EFFECTS ON THE SYSTEM.

BY WM. F. DUNLOP, DENTIST, ALPENA, MICH.

The few thoughts which I shall present on this subject, perhaps will be interesting to at least those who have had trouble in this direction.

I shall follow the history of teeth just from the time at which their formation commences, which is at the seventh week of fœtal life, and I shall only speak of the changes that take place in the system caused by the disease of these organs. When a child is teething the mother thinks it is only a little trouble, simply teething, but she does not understand that great changes are taking place througout the system. All the secretions of the body have to change in order to digest this new food. The child has been since birth, taking liquid food and other materials easy to digest; now comes the change. The teeth are meant to masticate hard food, or such as will be suitable to support the child. At about this time the child begins to walk and take exercise, and needs strong food to support it while undergoing this unusual exertion.

We find the temporary teeth making their appearance about the seventh month, commencing with the lower incisors, and so on, until the end of the second year, when the molars finish the temporary denture. I have always made it a rule to extract the temporary teeth when the time was up for the permanent ones to appear; and as soon as they were out of the way, the others came in a very short time, and in their proper positions.

In this way there is no pain by one pushing the other out of the way, and the permanent ones are straight and repay you for any trouble taken. After this, the owner of such a set of teeth should pay a visit to some dentist,—a man who is a graduate of some first-class school, having men to teach just what is expected of a dentist by those who become his patients, and put explicit confidence in his dealings with them.

All stains, tartar and any food that would tend to decompose, should be kept from the surface of the teeth, as the mouth is at just about the right temperature for decomposition. Tartar has not the same effect as stains upon the teeth, but it causes the gum to recede from the necks of the teeth and leaves the gum in a congested condition, and after some time the teeth will get loose and fall out, or give such pain that they will have to be extracted without even giving them a trial in a good dentist's hands to save them, and this will be kept up until the patient has lost all these valuable organs—teeth. And now comes the great trouble,—no teeth to masticate

the food that is supposed to support the system, but still the hard work has to be done. Soon the stomach is out of order,—indigestion, dyspepsia, and hundreds of other troubles, caused by not masticating the food. Others let the teeth decay until they are devitalized; then they, by some cold in the system, start to abscess, and the pus is more or less taken with the food into the stomach, and although this might do no great harm, still it is better out of the system.

I will now offer a few points of interest which I have copied from a leading work on dentistry.

"*Save the Teeth*—When a tooth aches, the first suggestion is to have it out. But I do not hesitate to say, after many years of experience, that it is never neccessary to extract a tooth merely for the relief of pain. That there may be and are many other reasons of sufficient importance to justify extraction, I of course admit, and these should have proper consideration in cases of toothache; but what I mean to say, is simply this: There are two forms of pain rising from the teeth, which will include at least ninety per cent of all the cases that will come to a dentist in good practice; we will call these primary and secondary toothache, and I contend that in neither of these, is extraction ever the remedy to be chosen without careful deliberation.

"Primary toothache is congestion of the tooth pulp; the unyielding walls of the pulp cavity permitting no expansion there is intense pressure on the nerve tissue and consequent pain, which finally terminates by strangulation of the pulp. This is true toothache arising in the tooth, but it may be felt in the terminals of any branches of the fifth nerve, on the corresponding side of the face, and is rarely felt in the tooth where it originates, unless there is suppuration in the pulp, in which case the peridental membrane will be affected. It will be obvious that many cases of so called neuralgia in the face are simply toothache, and a careful search will generally reveal the offender, but there will be no occasion for extraction. Careful excavation sufficient to allow an escape of blood from the pulp, will at once relieve the pain, and an arsenical dressing will devitalize the pulp, and there need not be anything like the pain of extraction.

"To complete the operation the pulp must be removed from the root canals, and these filled to the apex, but this will call for special skill and no harm will be done if there should be three or four weeks of delay. Nothing in a dentist's experience is more melancholy than to look into a mouth and see six or eight detached grinding teeth without an antagonizing tooth in the opposite jaw.

"The child needs masticators quite as well as an adult; but more than this, I am certain that it is almost an impossibility to extract a temporary molar when it is in anything like full development, without more or less displacement of the partially developed bi-cuspid which lies between the roots of the temporary molar.

"I am well aware that it has been said over and over again, by writers who are recognized as authority, that the development of the alveolus of the bi-cuspids does not depend on the retention of the temporary teeth; but what does that matter if the partial calcified crown of the bi-cuspid is so displaced, that the further development goes on with the tooth with a transverse or horizontal position? I have seen models of the upper and lower jaws of a boy of ten years and a half of age, whose temporary molars and two canines were all taken out while in most perfect development, and the gums are shrunken like those of an old man, without

the slightest indication of a bi-cuspid appearing for the next five years. I often see cases where some of the temporary molars have been removed, but I confess I do not often see cases of such wholesale premature extraction."

FOURTH SESSION, FRIDAY, JULY 11, AT 2 P. M.

After an instrumental solo by Mrs. Clothier, Prof. F. S. Dewey read the following paper:

HEATING AND VENTILATION.

BY PROF. F. S. DEWEY, ALPENA, MICH.

The subjects of heating and ventilation are so closely connected that it is almost impossible to have the one without the other on account of their inter-dependence; so does a discussion of the one involve a discussion of the other. If we would have a good, even, thorough distribution of heat throughout a building, then must we have some ventilation; and to ventilate a building thoroughly in all its parts without the employment of heat would necessitate a mechanical process altogether to expensive for general use.

I believe we may safely lay down this proposition:—That he who seeks the successful warming of a building will find his success in the direction of ventilation; and he who seeks the key to the successful ventilation of a building will find it in the fire.

In the warming of a building there are two things to do: First, to bring it up to the proper temperature; second, to provide against a constant loss, such as radiation through the walls, through floors, ceilings, roof and windows, and also the loss occasioned by the constant inflow of fresh cool air.

Many people suppose that thick, solid walls of masonry will "keep the frost out," in other words, that they will keep the heat in. This may or may not be sound logic, but it usually is not. It can not be depended on. A house built of iron, though it might be as tight as a boiler, would scarcely be warmer than a bird cage, while one built of porous paper fairly backed by wood, may be much warmer than one of solid stone. Many aim to make the walls absolutely air-tight, and for this purpose use a very thin, light compact paper on the false supposition that heat can only escape as air escapes. This is a very prevalent fallacy. Heat can crawl through cast iron, can dodge through brass with ten times greater facility than it can go through cheap, tar felt. The successful imprisonment of heat depends, therefore, not so much on air-tight walls as it does on non-conducting walls; not so much on their solidity, as on their porosity.

A wooden building with walls well lined or covered with thick paper will require less heat to keep it warm than one of solid brick; while a building whose walls are brick will generally require no more than two-thirds as much fuel as one whose walls are of the same thickness and made of stone. And if the walls are not plastered then, the walls being of

equal thickness, the stone building will demand almost twice the fuel required for that of brick.

Another great source of radiation is the windows. The making of them air-tight helps but little. During low temperature a cold current is always felt in their vicinity. This is neither cold air coming in nor a draught passing out, but the air of the room robbed of its heat dropping like water on the window sill. The best means for providing against this rapid loss of heat, is the double window, or rather, an extra outside or inside window to be put on during cold weather. Not far from one-half the loss of heat in a building is through the windows, and more than one-half of this half, or more than a quarter of the heat may be saved by the double windows, and 25 per cent saving of fuel in a cold climate is certainly an item worth considering.

In the successful heating of a building, a very important item lies in having ample size for the heater, just as the successful ventilation of a building depends upon the large size of its pipes. The small size of the furnace, the small pipes for feeding cold and drawing off warm air and the inadequate means of escape for the air of the rooms, furnish very fruitful sources of failure.

The size of the heater need not always be in the ratio of the size of the building. Much depends on the exposure, on the material of the walls, of the roof, on the windows, and very much on the ventilation. Anyone who expects to get good ventilation without paying for it in fuel, might as well expect to get good preaching without paying for it in money. There may be wasteful extravagance, however, in the one case as well as in the other.

As the common stove affords the least amount of ventilation and the largest percentage of heat, it is popular for warming; but as it requires no air except the little for combustion of fuel, it is a poor dependence for ventilation. The open grate or fire place with its curling flame, its ruddy glow, its invigorating beams, is a most delightful source of heat, but it is wastefully extravagant in fuel. Indeed more than 85 per cent of the heat generated in the open grate is wasted and sent off up chimney, doing no good whatever except by way of ventilation. It is however, an admirable auxiliary with a furnace, for furnishing excellent ventilation, and its cheering glow serves to attract about it the historical family circle.

The ordinary hot-air furnace, which is simply an encased stove, usually placed in the basement, must, for many reasons remain a favorite generator of heat. Whenever this fails, it is almost universally attributable to the setting and the piping. Large size of fire box, ample radiating surface, abundant flow of air, direct and sufficient smoke flue, and a sure means of escape for the air of each room to be heated, these are all absolute essentials to success. The inlet pipe should be nearly as large in its smallest part as the combined area of all the hot-air pipes leading from the hot-air chamber. The combustion should be regulated not by a damper in the smoke flue, but by the opening or closing of the aperture for the admission of air to the fire. If the heating surface is as large as it should be, and a proper flow of air through the furnace is maintained, the fire box need never be made red hot.

The closing of registers shuts the heat in the furnace and often allows it to become dangerously overheated. The shutting then of either the inlet pipe or the hot-air registers, is a very ready means for the destruction of the furnaces. I shall show in a moment, a far better means of regulating

the amount of heat from a furnace, and at the same time of maintaining a continuous, uninterrupted flow of air through the hot-air chamber.

Steam and hot water are favorite means of conveying heat long distances, and for distributing it in many rooms; but if the direct radiators are used they are very objectionable as they provide no means of ventilation. The indirect method, where it can be advantageously used, is much to be preferred, and is substantially the same as the warm-air furnace. It possesses this advantage, however, that it may be located just under or in close proximity to each room and furnish over its coils an abundant flow of fresh air.

By a wise provision of Providence, that which is most essential to the existence and well being of man, is most abundant. Fresh air, always needed, is everywhere unless man has made provisions for shutting it out. The exhalations from the lungs, the various emanations from the body, are poisons which do far more damage to mankind, and are the source of more diseases, than are all the other poisons in the world. To dispose of these products of animal combustion—this constant waste material, on the one hand, and to bring in fresh air suitable for comfort and health on the other—this is the province of ventilation. From ten to fifteen cubic feet of air are inhaled by each person per hour. More than half a cubic foot of exhalation per hour is the foul carbonic acid. This vitiates, or poisons hundreds of cubic feet more. The air from the lungs contains more than a hundred times as much poisonous gases as does the air in its normal condition, and it also contains foul vapor emanations of from one to three ounces per hour. To breathe these over and over again is to court disease and death. It is my belief that 40 per cent of all fatal diseases are due to impure air. There is no one defect in our public schools today that is comparable in gravity to that of foul air. Children are sent to school, and soon the bloom deserts their rosy cheeks; they grow pale and sickly, and their parents charge it to hard study, to over-work. I believe that very few pupils die, or even suffer from over-work in schools. It is lack of invigorating, life-sustaining oxygen. There can be no thought without life, no life without oxygen; and no sufficient supply of oxygen without ventilation.

A thorough system of ventilation and heating should answer many demands.

(*a.*) It should furnish ample heat.

(*b.*) It should distribute the same evenly throughout the building to be heated.

(*c.*) It should introduce a sufficient quantity of fresh air in proportion to the actual needs of the inmates.

(*d.*) It should thoroughly warm and sufficiently moisten the same before it enters the room.

(*e.*) It should furnish ventilation only when there is somebody to ventilate for.

(*f.*) It should be entirely under the control of the teacher, or the intelligence to be benefited.

(*g.*) It should draw the foul air off from the floor.

(*h.*) It should have no connection whatever with any closet, vault, cesspool, urinal, or any other source of deadly gases or foul and fatal emanations.

(*i.*) It ought to be adaptable to any building, old or new, heated by stove or furnace, and with or without a ventilating flue.

Much has been said at these conventions heretofore concerning a

system of ventilation which has connected with it and located in the basement an arrangement which its managers have been pleased to denominate a "dry closet."

In this so-called dry closet as found in the third ward school in this city, there is a large open passage way leading from an ordinary privy vault up into every room in the building. Neither the teacher, nor the janitor has any power whatever to close it. If a good fire is kept the air is drawn off the floor of the rooms down over the ordure there deposited. It is laden with the moisture from the evaporating fire of the furnace, if there be one, and all the breath and exhalations from all the pupils. It is far more moist than the outside atmosphere. The urinals and the floor all about them are soaking wet and the excreta beneath the seats is in precisely the same condition as it is in any vault out doors. After it has been there a week, you can no more burn it than you can burn mud; and when on Friday night it is pushed along that low passage way into the very base of the stack, it is just as impossible to burn it on the following Monday morning. It is then taken on a shovel and carried around and put into one of the furnaces where it often puts the fire out, and under any circumstances sends during its cremation, a most sickening stench down upon the people, and frequently out into the basement, precisely the same as the imaginary fire beneath the seats, which they now advertise, would ceaselessly send off.

Talk about cremating it "*in situ*." Why the seats are of wood, the covers are of wood, the floor is of wood; and to instruct the janitor to attempt to burn it "*in situ*" would be to instruct to burn the building. And as their scientific expert himself said, "It would be foolish to attempt it."

The advocates of this system say, think of the vast amount of air passing through the vaults. Well, what of it? There is not nearly so much as there would be out doors, and it is not so dry, and a personal inspection would satisfy the most fastidious that the excreta are a long ways from possessing any resemblance whatever to "Buffalo Chips." The odor arising therefrom, not only must be, but is proportional in amount and the same in kind as that from any other vault. Furthermore, the water has soaked the bottom of the basement away beyond the walls of the room, and the cement floors about the furnaces themselves are thoroughly saturated therewith. Last week every room above was foul with the sickening odors from below. Unfortunately the fire goes out nearly every night in spite of every precaution, and in the morning the rooms are filled with that same sickening stench.

Often the currents change during the session of school, and I am told that the children are sickened, sometimes half a dozen at once, by the back draft; and yet, here we have, as Mr. Smead told me himself, the "dry closet" system in all its perfection. I know this is not a beautiful picture, but it is their own. They made it. The janitor has followed directions exactly, has got up and built fires in cold weather, at half past four and five o'clock, to insure safety and warmth to those who were yet fast asleep in bed; has filled those rooms full of warm air from ten to twenty times, each time a little warmer, only to send it down through those closets and off out-doors again before anybody came to ventilate, for this must be done to take care of that so-called "dry closet." What economy! What a travesty on common sense! "Sixty thousand cubic feet hourly!" Two hundred and forty thousand cubic feet of air warmed and

wasted before there is anyone there to use it, and yet, he who dares raise his voice against all this is charged with "slanderous accusations and malicious intent."

Their scientific expert very naively informed us, that these microbes and these germs sent up the flue and scattered broadcast over the people, were diluted so as to be perfectly harmless, and when forced to the conclusion that a seed could not be diluted any more than an ox or a bush, or a Canada thistle, he then gave us this consoling assurance that they were "disseminated." "Take comfort in this thought," "they are only disseminated."

We are now told, that, directly under each seat, a raging fire is to be kept up "beneath and for a short distance above the platform, over 300 degrees F." in fact a hot stove for the ordure to fry upon. No need of any garden of roses in that neighborhood!

When our children go from us for the first time, we are asked to put them at the top of the wide passage way that leads down to death. The most virulent, insidious poison encountered by any creature is the poison of its own excreta. Whole families of animals are checked from overrunning the earth by this means alone; and yet we are told to fill the pure bracing atmosphere of Alpena full of it. Why, even the dogs and cats know bettter than this, and bury it, or try to. Very many of the animals whose excreta is offensive possess a higher degree of intelligence than this displays.

The Smead system condemns itself from a commercial point of view, because it is enormously expensive both to get and to maintain. It condemns itself from a ventilating point of view, (*a*) because nobody for whom ventilation is provided has any control over the amount of ventilation whatsoever; (*b*), it furnishes ventilation exactly according to the amount of heat; (*c*), the fewer the pupils, the greater the amount of heat required; the more pupils, the less heat required; hence the more pupils, the less ventilation, and the fewer pupils, the more ventilation; (*d*), during the morning hours it fill the rooms with partially warmed air from ten to twenty times and turns it off out doors again when no one is present to ventilate for, thus entailing a great waste of fuel.

As several rooms run into one passage-way the system ventilates one room at the expense of the other. Yesterday forenoon, with a fire two or three hours in the stack, two of the rooms were receiving a strong current of air up from the vault while the other two were sending a like current down.

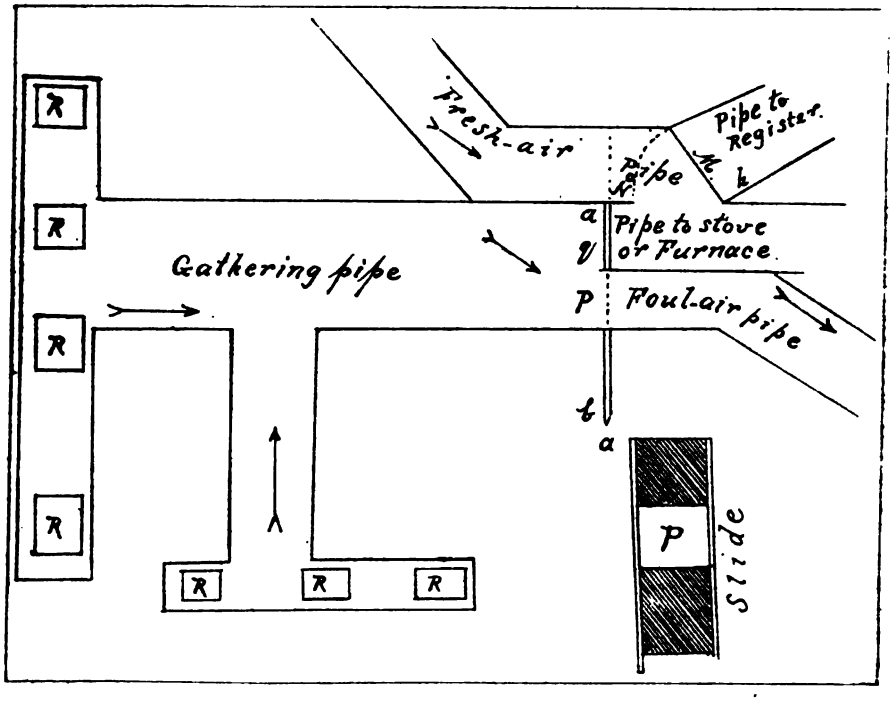
The so-called dry closet condemns itself because it is no dry closet in any sense of the word,—nothing but a common privy vault having no hot air, no warm air, no dry air, no provision for burning the excreta, no valve for shutting off the back draft into the rooms, because it fills the rooms with the sickening, poisonous odor, because a fire must be always maintained, the windows must never be opened, and especially in warm summer days, and the whole closet system is a steaming wet mass of filth and nastiness, too disgusting to be tolerated under a school house for a single day.

We have been naively asked,—how they succeed in putting this thing into so many schoolhouses? Why, the same degree of enterprise which was shown here would almost force the thing into paradise itself. A preconcerted meeting in the Saginaw valley, a contract for the dear "dry closet" before the plans were drawn, even before any plans were advertised for; this is the kind of systematic enterprise that ought to bear some

fruit. The long newspaper advertisements, the flooding of the city with beautiful pictures and glowing descriptions, which to be sure are against "the first judgment of nearly every man" and against the last judgment of all our very best scientists, and the common sense of us all, this kind of enterprise among a people so ready to be humbugged with what they do not understand and have no time to investigate, all these things do not run to vines. If any see in this a fancy sketch, let him investigate for himself. Let him go, as I have done repeatedly, and examine it. Make careful inquiry of those who know, and there can be but one conclusion.

The device shown in the accompanying cut is a simple piece of mechanism and adaptable to any kind of building heated either by stove or warm air furnace, or indirect steam or hot water radiation. It will be seen also, that it is particularly adapted to country schoolhouses which have no basement or ventilating flue, and no janitor to look after ventilation.

Ventilating Apparatus. Prof. F. S. Dewey.



In case the building or room is heated by a furnace there will be a gathering pipe to collect the air of the room and convey it either to the furnace to be re-heated or to the foul air pipe as may be desired, also a fresh-air pipe to conduct fresh air to the furnace, and a branch from this fresh-air pipe to the warm-air pipe leading from the furnace to the room, and a slide so arranged and connected with a lever or button near the teacher's desk that the teacher may at will, regulate by a single movement the flow of air in all these pipes and may thus have perfect control of the ventilation.

The diagram shows the air of the room passing through the gathering

pipe to the foul-air pipe and up the ventilating flue, while the fresh air is being conducted to the furnace to be heated.

The perforated slide is located now at a. b. P. with the perforation at P. If no ventilation is desired, as during the night, or while heating up in the morning, the slide is pushed in until the perforation P. is at q. It will now be seen that the fresh-air pipe and foul-air pipe are both closed, and the perforation being at q. the gathering pipe conducts the air of the room to the furnace to be re-heated. By this operation of re-heating the air of the room in the morning, the fuel used is but a small fraction of what would be required if the air as fast as heated were turned off out doors again, as is sometimes done fifteen or twenty times before there is any one to ventilate for. If partial ventilation only, is desired, the slide is partly drawn out so as to leave each of the three pipes partly open.

In case the room becomes over-heated and the teacher desires to cool it off, provision is made for this by having a branch pipe to the register opening from the fresh-air pipe by the door M, hinged at h, and held shut by gravity, or other suitable means. A line is fixed at M, and also at a, of the slide around pulley N, in such manner that door M, will not be opened at all until the slide a, P, b, is drawn out nearly as far as it can go. The last one or two inches, however, of movement of the slide throws the door M, open and partly closes the pipe to the furnace, thus letting a stream of of cold air directly into the warm-air-inlet pipe. The teacher, therefore, without knowing anything about the mechanism of the apparatus, can follow printed directions and make no mistake.

If a stove is used, it is placed close up in one corner of the room, and jacketed with sheet iron, much the same as a common furnace is jacketed with brick, this jacket being so lined as to divide the incoming current, and letting that stream of air which enters between the inner and the outer wall of the jacket, come in but little heated. There is then, also, a heated current between the inner lining and the stove, these two currents uniting just as they enter the room. There will be almost no direct radiation, and pupils seated a foot or two from the stove really occupy the coolest part in the room. This is obvious as the warmer air will go where the cool air is being drawn off. If there is no ventilating chimney a large sheet iron pipe is made to lead up from the foul-air pipe through the floor and is flattened out between the stove and the inner lining of the jacket and is so crowded against the stove and the smoke pipe that it is thoroughly heated, thus producing a strong upward current of foul air which is emptied into the attic or out through the roof. The branch pipe to register, of course, is not used with a stove.

These pipes should be made of sufficient capacity (say, not less than four square feet of cross section for each room), to carry from 600 to 1,000 cubic feet of air per minute. They may be made of wood lined with tarred felt and are so simple and easy of construction that a couple of mechanics can make and put them in, all ready for use, in a single day, while the cost of the whole apparatus scarcely exceeds what is often paid for a single globe or a set of maps for our country schools.

This apparatus does two things not heretofore provided for: It puts the ventilation of the room in the hands of the teacher and entirely subject to her will, each room by itself, and requires no knowledge of the mechanism, nothing but the simple movement of a lever according to printed directions; and it also provides a thoroughly heated ventilating stack for conveying away the foul air. Both of these conditions are prime requisites to

satisfactory ventilation. With the first, the teacher can have a limited amount of ventilation and a large fire with a small school, or a large amount of ventilation and a small fire with a large school, while the heated ventilating pipe crowded against the stove carries away the foul air and coaxes in the fresh.

DISCUSSION OF PROF. DEWEY'S PAPER ON VENTILATION AND HEATING.

BY PROF. FALL, MEMBER OF THE STATE BOARD OF HEALTH, ALBION, MICH.

[Reporter's Abstract]

I am very sorry on your account that Dr. Kellogg is not here, or that some other person is not here to take his place; not because I do not feel somewhat familiar with the question of heating and ventilation, but because I would much rather hear some other man's ideas upon the subject than to express my own. First, I want to express my pleasure at having heard this paper, and agree with its statements and the interdependence of heating and ventilation. I do not know that I can do better now than to state some facts that have come before the State Board of Health, and some principles that have been established by the Board. We come in contact with critics all over the State, and the views of the Board have become somewhat crystallized.

Foul air should not come back to us from the privy vault, or from the inhabitants of another room, that is, each room should have its own separate foul-air outlet that should lead distinctly to the outer air. Take for example the building over here mentioned by Professor Dewey; under certain circumstances, the air will pass out of the room as it should, but under other circumstances, it will pass from one room into another. We were over there and investigated that building, and made some experiments to test its ventilation, and the air instead of coming in at the proper inlet was instead coming in from an objectionable source. Some years ago the State Board of Health went to Detroit to examine plans for an asylum. The plan proposed was to take the air from all of the rooms on one wing and send it out at a common receptacle. The Board suggested that it would not do to take the chance of the foul air from one side of the building going over the rooms and down and out the other side. They were told that that was an impossibility, but it has been verified to be true at Kalamazoo where the rooms are so ventilated that if a window is open or broken the only fresh-air supply will sometimes be the foul air of some other room. This subject of ventilation should be studied with reference to those diseases that cause the most deaths. My profession has many times called my attention to the deaths that are the result of too close confinement in poorly ventilated school rooms. We know that many of the deaths come from consumption. This dread disease is spread mainly by the dust of the air. The ventilation of our school rooms should not be arranged so that the consumptives in one room shall poison the air in another. A method of ventilation should be adopted that will carry off the foul air before it is inhaled by the occcupants of the room. Nearly all contagious diseases are communicated by particles of dust in the air we breathe, therefore the foul air should be taken out of the room at the lowest level. The dust should

not be permitted to rise into the air to be inhaled. The air should be taken out of the lower level so that the occupants of the room shall breathe fresh air all the time instead of the foul air.

I will not say anything more at this time unless some question is asked.

After a duet by Mr. and Mrs. Depew, the following paper was read:

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE MINISTER.

BY H. H. VAN AUKEN, ALPENA, MICH.

Having been called upon to represent the clergy upon the question, how communicable diseases may be prevented, I propose to say a few words from the standpoint of christian ethics. It is generally conceded that it is the mission of the christian church to care not only for the good of man's intellectual and spiritual being, but to watch over and promote his bodily health. "A sound mind in a sound body" is becoming more and more to be one of the cardinal principles of the church. We have learned in the bitter school of experience, that it is very difficult to elevate men morally and spiritually, who are diseased or who live in the midst of filth, and surrounded by those conditions that breed disease. Hence if the church is to be successful in building up a righteous life and a noble character, she must do all she can to remove all hindrances to her work, and as disease is one of the greatest hindrances to her success, she must seek to eliminate it, or reduce it to its minimum.

The great founder of the christian system, sought both by example and precept to minister to the good of both soul and body, in fact, it was His custom to heal the diseased body that he might the more effectually heal the soul, and in doing this, He frequently had to deny himself. So to day, it is not enough that we pray for the angel of health to hover on poised wing over our community. We may need to deny ourselves the privilege of being careless about our premises, lest in spite of our praying, our neighbors are made sick through our neglect or indifference. Sickness is a fruitful source of sorrow and of suffering, and when we reflect that at least one-third of it might be eliminated if the laws of health were better understood and obeyed, it becomes important that those who shape public sentiment should be awake to the dangers and also to the opportunities of doing good.

The same God that said "Thou shalt not steal" enacted the laws of health, and for the violation of the latter the penalty is sickness and suffering, which may be followed by physical degeneracy unto the third and fourth generation. Hence, the clergy should teach that to violate physical law is a sin against a great and good God, who in benevolence has planned for the well-being of man.

I am aware that the laws of health are not the minister's specialty, but they can take those facts and principles that have been discovered by those who have made those laws their life study and bind them upon the hearts and consciences of their people. There is no class of men that

comes in such close touch with the masses and that has such opportunities for access to the public ear as the ministry. And having that opportunity, they are responsible if they neglect to help mankind out of the sorrow and suffering that afflict men, and from which they might escape if better instructed. From rostrum and pulpit we should carry to them the "Elixir of Life."

More time should be given toward building up the *here* and the *now*, it being the surest way to prepare for the future, for I believe it to be a well established fact that there would be less crime, intemperance and sins of various kinds, if there were better health among the masses. And, as an agency for this prevention of disease, the clergy should toil to create confidence in the constituted boards of health and the skilled medical fraternity, so that the public would cheerfully comply with required sanitation, submit to quarantine when necessary, and voluntarily be vaccinnated.

No doubt, it has often been the case that, when many have been carried off by communicable diseases, the officiating clergy have invoked Deity to abate the calamity; whereas, if they had gone into their pulpits and told the people to clean up their premises, disinfect their houses and the clothing worn by the sick, to be careful about their sewerage, warned them against cess-pools and taught them to do away with the death-dealing funeral, the pestilence would have abated. I am not asking for less praying, but for more obeying of Nature's laws; "for whatsoever a man soweth, that shall he also reap."

The best quarantine against communicable disease is that cleanliness which is the older sister of Godliness. Certainly no one desires to be sick, and yet, it is affirmed by the wise men upon this subject, that thousands die yearly who might live to bless their families, if they had lived in harmony with the laws of health. Thus it is that the people perish for the want of knowledge, and as the pulpit is one of the recognized agencies for the dissemination of information, let it be prepared to give to the people, from time to time, those well settled principles and rules that have been discovered by those who have made this subject of sanitation their life study.

False public sentiment must be corrected, and every individual brought to the conviction that it is his duty to sacrifice some part of his personal liberty for the general good. That is in keeping with the law of love, "Doing unto others as we would have others do unto us."

If the christian church could lift men up to that standard, it would not only solve many of the social and economical questions of the age, but it would prolong human life many years, and bring the bloom of youth back to fading cheeks and wipe the tears of sorrow from many eyes; for it would do away with the breeding places of the pestilential diptheria, typhoid fever and kindred ills.

So I would say in conclusion, let the pulpit educate the people so that they shall live out more than half their years; let it do all that it can to quicken the public conscience, and to intensify conviction on the importance of a proper regard for the laws of health.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE LAYWER.

BY WILLIAM E. DEPEW, ATTORNEY AT LAW, ALPENA, MICH.

All civilized people, ancient and modern, have, when necessity required it, made provision for the protection of the public health. The sparse settlements of a new country have but little necessity for such regulations. But as population increases and large numbers of people are required to live near each other, so near that the conduct of one may affect others, then such laws become a necessity and are soon enacted. The early settlers of our Atlantic coast had little use for laws of this character; yet, when these settlements were followed by the rapid growth of New York, Philadelphia and other cities, such laws became necessary. They were enacted by the legislatures of the several States, passed upon and sustained by the several courts of these States. When the people of our State commenced this class of legislation, they were able to profit somewhat by the wisdom and experience of these older commonwealths.

We, of course, feel that our laws for the protection of the public health are very good, and that we could hardly look to a better source from which to learn the methods of affording this protection; yet, we must not forget that regulations were made by different peoples many centuries ago, from which we can obtain wisdom.

In May and June, 1862, the United States forces under command of General Butler, were in full possession of New Orleans. The inhabitants of that city were delighted to tell the Union soldiers that the time had about arrived for the coming of the yellow fever; that they would soon go, and that the confederates would soon again control the city,—that people recently from the north always died first.

In the North American Review for November, 1888, General Butler tells of his experience as follows:

"The General in command was in the very unfortunate predicament of not having a single surgeon in his army who had ever seen a case of yellow fever. He immediately applied to Washington to send him one; but to get such detail, through the usual course, would take, and did take many weeks. The General's time and attention, in addition to all other duties, was very much taken up by the multiplied and continued applications of his officers to be allowed to resign and go home, to do which there was a very great temptation, independently of a wish to avoid this awful disease, believed to be surely and steadily approaching, from which men shrunk with trembling, who with a gleeful smile would have marched up to a cannon's mouth upon the simplest order. * * * The General had never heard of the yellow fever in the East; had heard of the plagues of cholera and leprosy as terrible scourges.

"While this country was substantially exempt from them, why should we be cursed with the other? He had not within reach, if there are any such, any works to enlighten him upon the topic.

"He knew of one, and everybody else knew of the same one,—the Bible, —but which he had not heard quoted as a work on diseases. In that, were

the books of Moses. Now without discussing the question whether Moses was taught directly of God as to the writings of his Books and his instruction to the Israelites, as wholly one side of this examination, it is certain Moses had all the learning of the Egyptians, which included all the learning of that time in the world, upon dealing with the diseases incident to large bodies of men gathered together in a hot climate."

General Butler points out the rules prescribed by Moses in Leviticus and Deuteronomy, and, following these teachings, he thoroughly cleansed the city. He was compelled to put one man into the guard house for throwing some paper into the street, and had also to put one fashionable lady in a carriage and start her to jail for disobeying his orders in regard to cleaning up her premises, but before reaching there, she changed her mind. As a result of these precautions, there was but one case of yellow fever in the city, and that was brought in on a steam vessel. Not many would have thought of looking where General Butler did for his information. We are thus shown that all knowledge of such matters is not confined to modern times. We do not know what may have been the practice of General Butler since the war, but we do know that at one time at least, he obeyed the injunction,—"Search the Scriptures."

In England, the common law furnished quite extended rules for the preservation of the public health. And this law is found in Blackstone's Commentaries, and England has since enacted a very complete system of laws for this purpose. All the States of the Union that have been admitted long enough to have an opportunity to do so, have passed laws for the protection of the public health.

The early legislators of our State seemed not to pass laws simply for the time in which they lived, but, with a wisdom that could look far away into the future, enacted laws for the great and prosperous State into which we are grown. As they laid the foundation for our University and other public institutions broad and strong, they did not forget the public health.

In the Revised Statutes of 1838, one year after the admission of the State into the Union, we find a complete system of laws concerning the public health in two chapters, entitled as follows:

Chapter I. "Of the Preservation of the Public Health, Quarantine, Nuisances and Offensive Trades."

Chapter 2. "Of Medical Societies, and the Regulations concerning the Practice of Physic and Surgery."

These laws have been added to and amended till our present system of laws concerning the public health has grown up, as found in Howell's Statutes of Michigan, and the amendments thereto.

The Constitution and laws of the United States and of our State guarantee to every one the right to own and hold property; to freely use and enjoy it as he may see fit. It is impossible to enact and enforce laws for the preservation of the public health without in some cases interfering with the manner in which private property is used. When these laws step in and say that a man shall or shall not use his property for such purpose and in such manner as he pleases, he may, perhaps, conceive that his constitutional rights have been interfered with, and when a man feels that these rights are interfered with, whether he is greatly injured or not, he prepares for a legal struggle, and the laws in the several States concerning the public health have caused a considerable amount of litigation, and the courts of last resort in the older States have often passed upon questions arising under these laws. The courts of the several States have sustained

and enforced these laws, and have held that the legislatures of the several States had power to make such laws under and by virtue of the police powers of the States.

In People v. Phippin, 70 Mich., 18, Mr. Justice Long says: "The several States of the Union possess a general police power by which persons and property are subjected to all kinds of restraint and burdens, in order to secure the general comfort, health and prosperity of the State."

In Beer company vs. Massachusetts, 97 U. S., 33, Mr. Justice Bradley says: "Whatever differences of opinion may exist as to the extent and boundaries of the police power, and however difficult it may be to render a satisfactory definition of it, there seems to be no doubt that it does extend to the protection of the lives, health and property of the citizens, and to the preservation of good order and the public morals * * * They belong emphatically to that class of objects which demand the application of the maxim '*Salus populi suprema lex*,' and they are to be obtained and provided for by such appropriate means as the legislative discretion may devise."

The legislature of a State has power to delegate to a city certain police powers, and the legislature of our State has given to our city the following authority concerning the public health: "The common council shall have power, and it shall be their duty to adopt measures for the preservation of the public health of said city, to restrain or prohibit the exercise of any unwholesome or dangerous avocation within the limits of said city, to establish a board of health, and to invest it with such powers, and to impose upon it such duties as shall be necessary to secure the inhabitants of said city from contagious, malignant and infectious diseases; to provide for its proper organization, and for the appointment of proper officers; and they shall have authority to make all such by-laws and regulations for the government of such board of health and for the preservation of the health of the inhabitants of said city as shall secure a prompt and efficient discharge of the duties imposed upon the common council by this Act."

The common council has power under its charter to make all needful provisions for the preservation of the public health, so far as it may deem necessary, in addition to the regulations already made by the legislature.

The necessity of laws concerning the public health is much the same as the necessity of criminal laws. In a large city nearly all men will be honest, but a few thieves will come in, and their presence makes it necessary that there shall be laws against larceny. In the same city nearly all residents will be cleanly in their persons and in the use of their property, but some will be found who keep their property in such condition that the law must step in and require them to so use their property as not to endanger the public health.

The learned clergyman who takes part in this convention will, without doubt, tell you that "cleanliness is next to godliness." And as he is good authority on such matters, we will treat the statement as true, and will say that the State and city, under their police powers, cannot force upon any man godliness; but they can, by virtue of these powers, impose upon all the people that which is next to godliness, namely, cleanliness.

After a vocal solo by Miss Small, the convention adjourned until the evening session.

FIFTH SESSION, FRIDAY, JULY 11, AT 8 P. M.

After a quartette by Mrs. Depew and Rice, and Messrs. Depew and Dunlop, the following paper was read:

THE WATER SUPPLY OF ALPENA.

BY CHARLES HOWELL, M. D., ALPENA, MICH.

It might seem at first thought, as if there could be no need of a discussion to desseminate knowledge concerning a fluid so universally spread over the globe, permeating its rocks and soil, and forming the greater bulk of its animal and vegetable formation, and so necessary to the life and comfort of man and animals, as water.

But a moment's thought reminds us that the supply of pure water for large cities and towns has been one of the most troublesome scientific problems that scientists have had to deal with. There is a growing tendency in all well-to-do communities to secure the best modern appliances for lighting households and places of business, and the best possible supply of good, pure water for domestic and business purposes. There is no community that can be healthy, prosperous and happy, without a good water-supply. A well-equipped fire department with a good and sufficient water-supply, is necessary to the growth and protection of every town and city.

A view of ancient history, as well as modern literature, gives us some idea of the importance attached to this subject in all ages of the world. A description of the aqueducts of the Egyptians, Romans, the Carthagenians, the Aztecs, and other ancient people, almost staggers belief at the present time. It is a historical fact that the water-supply of Rome during the first century of our era, was so abundant that whole rivers of water ran through her streets. The quantity was estimated at 375 millions of gallons per day, equivalent to 375 gallons to each individual. The supply was conducted to the city through nine costly conduits of brick and stone that tunneled hills and crossed rivers and ravines in the boldest manner possible, presenting great, skilled, engineering ability. Some of these aqueducts were made of three distinct arches placed one above the other, conveying water from different elevations. In Mexico and Peru are found ancient water channels of marvellous length, while India is noted for its vast reservoirs, one having an area of fifty thousand acres, and banks fifty miles in extent.

While the ancients have left monuments of their skill in collecting and conducting water, modern science has been, and is endeavoring to leave a reputation for its devotion to the knowledge of pollution in, and purification of water for the use, health and comfort of mankind.

The sacred historian tells us that the Garden of Eden was watered by four rivers of pure, crystal water, and, judging from the great age to which our paternal ancestors lived, they must have been free from all nitrates, nitrites, albuminoid ammonia, sulphates and microbes. Alga and other obnoxious plants did not contaminate them, or vex Adam's righteous soul. Diphtheria, typhoid or scarlet fever, measles or small-pox were unknown in that blissful abode, but for neglecting the most simple sanitary injunctions, Adam was driven from the beautiful garden, and his

descendants became so engrossed in the pursuit of wealth and fame, and so careless of sanitary science, that the earth became so corrupt that the great sanitary law-giver and universal health officer found it necessary to cleanse the earth by the heroic method of Noah's flood, a striking example of dilution. Later on, we are told that Lot chose the plains of Sodom because they were well watered, and he so far forgot that cleanliness was next to Godliness, the cities became so corrupt and filthy, that it was necessary to disinfect them with fire and brimstone. Lot's wife became a mass of chloride of sodium, and the waters are unfit for use unto this day. Naaman, the Assyrian, was ordered by the prophet Elisha, to wash seven times in the river Jordan, and he would be healed of his leprosy. He did not have much faith in the prescription, but followed the advice and was healed. Hence the origin of hydropathy. Its primogenitor, Elisha, would be called a "quack" in our day. Then at the pool of Bethsaida, we find the angel stirring up the water to oxiginate and ariate it and kill the microbes in it, when the lame, the halt and the blind bathed in it and were healed, just as we do now at Carlsbad or Colorado Springs. We see the Great Healer sending the micrococci from the insane man into a herd of swine, which ran down into the sea where the little devils found a congenial element for propagation, and have gone on multiplying until the waters of the whole earth are filled with them. As an incentive to live a virtuous life, we are told that the New Jerusalem, whose streets are paved with gold, has a river of pure water running in the midst thereof, the banks of which are lined with beautiful trees whose leaves are for the healing of the nation.

One would think from the vast amount of literature, discussion, argument and analysis devoted to the subject, that wholesome water scarcely existed; but this is not so; we find spring water, deep well water, and upland surface water not only palatable, but wholesome.

Even river water into which sewage has found its way, may be used for years without discovering anything wrong with it, but suddenly an epidemic breaks out from its use. So one is not surprised at the caution of scientists, when one takes into consideration the great affinity water has for almost every substance in nature, and its great solvent powers. It is never free from impurities. Chemically pure water can not be had for domestic use. The constituent parts of pure water in volume, are two parts of hydrogen and one of oxygen.

The impurities most likely to affect water, are: In rain water, atmospheric; in river and lake water, animal and vegetable organisms. The dangerous properties in either are, organic matter, chlorine, sulphates, free ammonia, albuminoid-ammonia, nitrites, and especially disease germs. The maximum amount of free ammonia permissible in drinking water is five-tenths of a grain in 1,000 gallons, and in albuminoid-ammonia, nine-tenths of a grain in 1,000 gallons. Any water containing more than this, is dangerous to public health. Good water contains no nitric acid, and any containing a sufficient quantity of nitrites to be estimated, is not safe for domestic use. The animal matter contained in sewage, the contents of privies, cess-pools and barn-yard manure, when dissolved in water undergoes oxidation in rivers, lakes and streams very slowly, and such waters should be avoided. When the oxidation is complete, they are resolved into mineral compounds, their carbon is converted into carbonic acid,

their hydrogen into water, but their nitrogen is transferred chiefly into ammonia, nitrates and nitric acid.

But there are dangerous qualities in water which the chemists cannot detect. Water may be able to spread the germs of cholera, or the germs of other communicable diseases, and yet no chemical re-agent or manipulator be able to detect them; but the microscope here steps in and reveals to us the dangerous contents of the clearest water. The surgeon or the scientist may not be able to take the vital principle on the point of his knife and say "here is life;" but the chemist and the microscopist can take from your hand a goblet of apparently pure water, and say "here is death to you and the community." There may be a large quantity of sewage thrown into a large water-supply, and yet no immediate harm results from it. It is the quality and not the quantity of sewage in water supply that makes it dangerous. Sewage that contains human excreta may contain the germs of cholera, dysentery, consumption, typhoid fever, and other communicable diseases. It is always dangerous, and should be avoided. Chemical analysis to be of any value should be made frequently and continually.

It is true that a large amount of refuse material is of such a character as to be, except in excessive quantities, of no appreciable influence on the human system. The addition of inorganic compounds, such as lime, soda and potash, would have no deleterious effect. Although the lime compounds increase the hardness of the water and make it less desirable for cleansing purposes, the presence of a moderate quantity of mineral substance would make the water more palatable, and very probably more healthful. There are causes constantly at work to destroy sewage, which to a certain extent, carry on a work of purification. These causes are principally oxidation, deposition, and dilution.

In order that oxidation may be carried on, there must be an excess of oxygen held in solution in the water above that of which the water is formed. And as most of the free oxygen is derived from the air, water in motion is supposed to be the best.

There is a large amount of refuse material finding its way into rivers and lakes that is nearly insoluble in water. This settles to the bottom, or is deposited along the banks and shores. This is deposition.

By far the most important reason of the apparent disappearance of sewage is the fact that the amount of solid matter is so small compared with the volume of water into which it is thrown, that it is disseminated through the mass and thus lost to observation, and in many cases, to chemical tests. Sewage is much more rapidly oxydized in passing through soil, sand and rocks, making filteration either artificial or natural of great value in purifying water. But as microbes and germs of disease find a congenial element in water for propagation (and they will live a long time, even in pure water), the water-supply should be carefully looked after. The rice water evacuations of cholera, the germs of typhoid fever and other communicable diseases however much diluted, still remain active in water, and a minute quantity may do much harm. There is at certain times, some material in human excreta capable of producing disease of a very fatal character in the human subject, and this morbific matter can be detected only by its action on the human system, not by chemical, or by microscopical analysis. Hence the necessity of careful vital statistics and a careful record of the diseases of the city or town. From them we may

learn the source and cause of disease better than any other way. The State Board of Health is doing a vast amount of work in this line and saving thousands of lives to the State every year.

The water-supply of the city of Alpena is drawn from Thunder Bay and Lake Huron, which is said to be as pure a body of fresh water as there is in the world.* The water is pumped directly in the water mains from the bay. The water-works are owned and operated by a private company. The pumping engine is situated on the Bay shore near Avery's mill, one mile north of the mouth of the river, and has a daily capacity of 1,300,000 gallons which can be increased to 3,000,000 gallons in case of fire. The company has a Holly pump at the dam in the river, with a capacity of 3,000,000 more. Both can be used in case of a large fire, giving the firemen twenty to twenty-five streams if required. There are twenty-two miles of water pipe now in use, which will be largely increased this year. There are 154 hydrants in the streets for fire purposes. There are 1,138 families using and paying for water; the average water-supply to each citizen is 100 gallons per day. The average annual cost to each family is $5.36.

The question arises,—Have we a good supply of pure drinking water? The well from which the water is taken is in the Bay, 1,400 feet from the pumping-station, six feet square and ten feet deep; it is a frame of pine logs placed about one inch apart; outside of this crib is another formed in the same way, leaving a space of three feet wide, this space is filled with gravel and stone; outside this crib is placed a large amount of stone. All the water used in the city is drawn through this filter; the well is placed one mile north of the flow of the river, the river flows toward the southeast after entering the Bay, and reaches the lake south of Sulphur Island. The sewers of the city, twelve in number, empty into the river within three-fourths of a mile of its mouth.*

The Churchill House and Golling House empty their débris into the river through private sewers. The hospital and other hotels use the city sewers. The cemeteries are within the city limits, and only a few rods from the river banks. The soil is loose, sandy and porous. The river is the open central sewer of the city. The sulphite-pulp mill discharges the washings from its fiber into the river.*

I herewith submit the report of analysis, of water taken from the hydrant after a storm and after a fire, made by Doctor Vaughan, June 10th, 1890. Probably the analysis would have shown much better water, if the sample had been taken under more favorable circumstances.

ANALYSES OF HYDRANT WATER AND SPRING WATER, ALPENA, MICHIGAN.

UNIVERSITY OF MICHIGAN.
Laboratory of Hygiene.

REPORT OF THE SANITARY CONDITION OF WATER SENT BY DR. HOWELL, ALPENA, MICHIGAN.

Source of the water, with remarks on the sanitary surroundings: No. 1 is from the hydrant of the water-works, No. 2 is from a spring which discharges water enough to supply the city.

* A map, illustrating the sewerage and water-supply of Alpena, is printed on page 28.

Physical Properties.

	Hydrant water.	Spring water.
Color	Clear.	Brownish.
Odor	None.	None.
Reaction	Neutral.	Neutral.
Hardness	8.1°—Clark's Scale.	39.9°.

Chemical Analysis.—Parts per million.

(1)	Total residue obtained by evaporation at 110° C	187	3,060
(2)	Residue after ignition, or inorganic matter in residue	162	2,269
(3)	Organic residue, or loss on ignition	25	791
(4)	Amount of earthy bases, calculated as oxides	49.616	70.638
(5)	Amount of chlorine, calculated as sodium chloride	6.60	4.64
(6)	Amount of sulphates calculated as SO_3	0	109.125
(7)	Parts of potassium, permanganate reduced by the organic matter in the water	8.104	4.102
(8)	Amount of free ammonia	0.148	0.072
(9)	Amount of albuminoid-ammonia	0.37	0.174
(10)	Amount of nitrates, calculated as N_2O_5	0	0
(11)	Amount of nitrites, calculated as N_2O_3	0	0

Explanation.

While no absolute standard for the chemical purity of drinking water can be given, the following conclusions may be regarded as approximately correct:

(1) The total residue should not exceed 500 parts per million.
(2) The inorganic residue may constitute the total residue.
(3) The smaller the amount of organic residue the better the water.
(4) The amount of earthy bases should not exceed 200 parts per million.
(5) The amount of sodium chloride should not exceed 10 parts per million. A larger amount may be expected, however, in certain salt-producing districts.
(6) The amouut of sulphates should not exceed 100 parts per million.
(7) The organic matter in one million parts of the water should not reduce more than 8 parts of potassium permanganate.
(8) The amount of free ammonia should not exceed 0.05 part per million.
(9) The amount of albuminoid ammonia should not exceed 0.15 part per million.
(10) The amount of nitric acid should not exceeed 0.5 part per million.
(11) The best water contains no nitrous acid, and any water, which contains this substance in quantity sufficient to be estimated should not be regarded as a safe drinking water.

Note—The word "trace" whenever used indicates the existence of the substance in quantity sufficient to be recognized by the test, but too small to be determined quantitatively.

Microscopical Examination.

Description of deposit, if any, magnified 100 diameters: *Hydrant water*—Fresh-water algæ, white amorphous material; *spring water*, amœba, diatoms, fresh-water algæ. Magnified 500 diameters: *Hydrant water*—Red spores of algæ, streptococci, oscillatoriæ, bacilli; *spring water*, zooglœa, several varieties of germs, amorphous matter.

Explanation.

Six ounces of the water are placed in a conical glass and the deposit, if any, is examined after from 12 to 24 hours. The presence of any appreciable deposit, especially if it be of animal or vegetable nature, would detract from the suitability of the water.

Bacteriological Examination.

Number of germs developod on a gelatine plate inoculated with one drop of water.

	Hydrant water.	Spring water.
(1) After 24 hours	0	0
(2) After 48 hours	2	0
(3) After 72 hours	22	2,880

Remarks on the kinds of germs observed:

Hydrant water—green bacillus of water, white liquefying bacillus.
Spring water—green bacillus of water, moulds, white superficial colony resembling potato bacillus.

Inoculation Experiments.

Kind of animal inoculated with the germs: Rats in both instances.
Method of inoculation: Abdominal injection in both instances.
Kind, amount and age of culture used: One drop of water in a drachm of beef-tea in both instances.
Result of the inoculation: *Hydrant water*, rat died. *Spring water*, no effect.
Post-mortem appearances: Organs all very dark, heart engorged with blood.
Description of the germs, if any, found in the organs: Bacilli.
In what organs were the germs, if any, found growing: Lungs, spleen and liver.

Explanation.

One drop of the water is added to one drachm of some culture medium, such as beef tea, and this after it has been kept at the temperature of the body for 24 hours or longer is used for inoculating animals.

Conclusions.

I think that, of the two, the spring water is the safer. Indeed there can be no question about this. However the spring water is not as pure as it might be expected, and the large number of germs which develope after 72 hours, leads me to suspect either that the spring is superficial or that the water becomes contaminated after it flows from the earth. The great hardness of the spring water would be objectionable for some reasons.

V. C. VAUGHAN,
Director of the Michigan State Laboratory of Hygiene.

ANN ARBOR, 10th June, 1890.

I also submit examinations made by Dr. Prescott, of three specimens of river and bay water: No. 1 is river water filtered, which is a good safe water for drinking and domestic use. No. 2 is bay water taken from the bay three miles out, and in line of the river flow; it is impure and dangerous. No. 3 is river water unfiltered, and is not safe.

ANALYSES OF RIVER WATER (FILTERED), OF BAY WATER AND OF RIVER WATER (UNFILTERED), ALPENA, MICHIGAN.

CHEMICAL LABORATORY,
UNIVERSITY OF MICHIGAN, ANN ARBOR,
October 31, 1885.

Water received from the city of Alpena, Michigan—C. L. Kimball chairman, city committee.

Quantitative analyses respecting purity for potable and domestic uses:

	River water (filtered) No. 1.	Bay water No. 2.	River water (unfiltered) No. 3.
Ammonia, free:			
Parts per million	0.04	0.17	0.09
Grains per gallon	0.00233	0.00992	0.00525
Ammonia albuminoid:			
Per million	0.14	0.29	0.33
Grains per gallon	0.00816	0.01692	0.01935
Chlorine, of chlorides:			
Per million	6.0	4.0	8.0
Grains per gallon	0.350	0.233	0.467
Permanganate:			
Reduced	Scarcely at all.	Slightly.	Considerably.
Color of the water	None.	Slight.	Decided.
Odor of the water	None.	None.	None.
Suspended matter	But little.	More than No. 1.	More than No. 2.
Blackening of residue on ignition	Slight.	Distinct.	Decided.
Hardness, by Clark's scale	12°	8°	11°

No. 1 is good water; to be recommended as safe for potable purposes. Its minute measures of organic matter come within the limits of safety. It is only moderately hard, ranking 12 degrees on Clark's scale.

No. 2 is not sufficiently free from organic matter to be safe as a drinking water.

No. 3 is more impure than No. 2.

In both No. 2 and No. 3 the measures of organic matter exceed the limits of safety for drinking and for culinary uses.

Notwithstanding the great amount of sewage emptied into the river, we have never had any epidemic of contagious disease. Our city has been one of the most healthy in the State.

We have three artesian wells in the city, one 1,200 feet deep, once celebrated for its healing properties; the other two are 600 feet deep, and discharge 800 gallons per minute of clear and apparently pure water, 28 feet above the ground.

There has never been any *alga*, or other vegetable growth in the hydrant water until one year ago, when a small amount of *alga* appeared, but soon disappeared, and has not since been seen. *Alga* does not injure water unless it appears in sufficiently large amounts to form decaying masses, or breeding places for animal life.

I think that our water-supply is as good as can be procured. It is inexhaustible, comparatively pure, and when kept free from sewage, is entirely safe for drinking and domestic purposes. A large portion of the city is built on what was originally a cedar swamp; it has been filled in with pine sawdust from sawmills of the city. The pitch and turpentine in the sawdust prevents its decay and the propagation of microbes.

The wind sweeps down through the pine forests surrounding the Bay, loaded with oxygen during the night. In the morning it returns from the lake pure, clear and invigorating, giving us a cool, healthy, delightful climate. It is the general impression that freezing purifies water by killing all animal life in it, and preventing fermentation. This is so to a very limited extent. Ice taken from impure waters contains nearly all of the impurities of the water from which it is taken.

The ice for the use of the city should be taken from the Bay near the supply crib, or to the north of the flow of the river.

The prevailing winds are from the north and east.

THE WATER-SUPPLY OF ALPENA.

DISCUSSION BY PROF. DELOS FALL, MEMBER OF THE STATE BOARD OF HEALTH, ALBION, MICH.

[Reporter's abstract.]

I am sure that I feel a great deal of embarrassment in standing before this audience tonight in the place of so distinguished a gentleman as Prof. Vaughan of Ann Arbor, who was to lead this discussion. I have been somewhat confused in listening to the paper, in ascertaining just where the city gets its water-supply, whether from the "Garden of Eden," the River Jordan, or Thunder Bay.

In that confusion, I think that I will assume that the source of all good things is not Alpena, but that my prejudices are in another place. I like to think of all good things as springing from Albion, the place that to me is the center of the universe. We have a man in Albion who boasts that water has not touched his back for forty years. That man is strong and vigorous, he has lived to a good old age, and yet, we would not take him as evidence of going without bathing in favor of health, over a frequent cleansing of the body with pure water. We have about 5,000 other people in Albion who have been drinking impure water,—contaminated water which is impure; 5,000 people, that means that all the inhabitants of Albion, taking water from wells as they have for the past 35 or 40 years, have been drinking contaminated water; because when 25 years ago a man came there and proceeded to build a home for himself, he excavated two places at least, one a shallow one for a cesspool or vault, the other one for his well. The shallow opening in the ground finally passed its contents into the lower receptacle and it, therefore, follows that these people have been drinking these impurities out of their wells, and yet, the people of Albion are healthy. I do not know what the figures are, yet I am quite sure we may lay the mortality statistics along side of this healthful city of Alpena. I wish to arouse your minds for the reception of the truth regarding the danger of drinking contaminated water, and

yet not seem to suffer from it. The significant fact is that by so doing, the system has been prepared for the real results of disease. The things that kill now-a-days, and which can be proved by the practice of these physicians here, are those diseases which are caused by specific germs, and the danger of drinking this water lies in the fact that these specific germs are scattered about the well, and they there find the proper conditions for their growth and development in large numbers. From the privy vault or the cesspool they make their way to the well, and finally into the water, and hence find lodgement in the human system, there to grow and develop the condition of the system we call disease. The danger is that, one of these days, some case will appear in your midst bearing these germs of disease, and drop them into the water supply, which, by virtue of the contaminating material it holds, is now ready to conduct those germs to any one that uses the water. I speak of the condition that exists in a town drawing its water supply from wells, but in cities where the water supply is taken from rivers and lakes the problem is the same. The river is properly the common sewer of this city, and therefore the water supply ought not to be taken from it, as it bears along with it thousands of these disease germs, and these impurities which form the proper *nidus* or soil for the growth and development of the germs that have thus been scattered into the river and multiplied by the millions. I want to describe an experiment which I sometimes make before my class in biology: We take some water that is suspected of containing germs that will produce a dangerous disease. We boil a potato and let it get cool, cut it in half, and over the cut surface, with a needle or knife-point take out a drop of this water and put it on the cut potato; the germs find the proper food for their propagation, and presently there will appear on the surface of the potato, a vegetable growth, the result of the development of these germs; enough of them in the aggregate to become visible to the naked eye. This will illustrate the remarkable power of these germs to reproduce themselves in great abundance.

Hence the danger of the water in your river, which if it ever reaches the intake pipe, will surely be introduced into the systems of those who drink it; and though the mouth of the river here is quite remote from the intake pipe, I should want to satisfy myself as to whether the water colored by sediment that we recognize out here in the bay as river water ever really makes its way into the intake pipe of your water-works. If it does you are liable to a great danger, if not, then you may feel safe in the use of this water. If this river water goes three miles straight out into the lake and can be detected, then there is danger that it might make its way into the intake of your water-works. I simply mention this that you may know what the danger is, however remote it may be, and if that danger makes itself apparent and the city of Alpena be asked to be taxed in order to remove the danger, I hope that the citizens here will be liberal enough to respond to the call for money, and thus put the whole question on a perfectly safe basis.

The following discussion, by Prof. Delos Fall, M. S., member of the State Board of Health, Albion, Michigan, was not received from the stenographer in time to be printed in its natural order, following Dr. J. D. Dunlop's paper on "Alcohol and Narcotics," on pages 7-11.

DISCUSSION OF J. D. DUNLOP'S PAPER, ALCOHOL AND NARCOTICS.

BY PROF. DELOS FALL, M. S., MEMBER OF THE STATE BOARD OF HEALTH, ALBION, MICH.

MR. PRESIDENT, LADIES AND GENTLEMEN:—In spite of the rather severe criticisms Dr. Dunlop has put upon the inhabitants of Alpena, he apoligizes for it.

I think that the city of Alpena is a most delightful place, it certainly has one of the most delightful bays and a most beautiful pleasure boat on which we had such a delightful trip this afternoon. On this trip we visited the Life Saving Station, and we looked into the faces of nine men; nine heroes, whose mission is to save life. They complain that the season is dull. We rejoice that the seasen is dull in their line of work. Their work is grand, for they will take their lives in their hands and go out to face the storms to save others.

We are here tonight on a similar errand of mercy, our mission is also life saving—the prevention of disease, the actual saving of human life in this country, if only the counsels are heeded which sanitary science brings forward. Now, one of the lines upon which sanitary science may work is the effect of alcohol and narcotics upon the human system. Certainly there is death in the cup, rum has its effect. We are doing what we can to stem the tide of that evil. Some people think it is best to stem this tide of intemperance by political measures, others by moral suasion, others by cool and clear cut scientific education in our schools. And this latter, permit me to say, is the one upon which we may base our greatest hopes. For if our boys may be taught in our schools in a way convincing to them so that they may see it clearly and know what its inevitable consequence is upon the human body by various scientific tests and experiments in the laboratory; if they enter upon this knowledge in this way, I am sure that many of them will be guided past the temptation of using it. So, then, my work tonight, will be an attempt at illustrating some of the methods of imparting instruction to the boys and girls of our schools as to the effect that alcohol has upon the body. I would not allow sentiment of any sort to creep into my instruction. I would not announce myself as an ardent temperance advocate or prohibitionist to my boys in school, for fear that that very statement would lead to prejudice in their minds and so render futile my instruction. I would teach this subject in the same cool, scientific manner that grammar or arithmetic is taught. So let me illustrate here: Our boys and girls in school learn something of the anatomy of the human body, they learn the different organs, the various parts, how they go together, how they operate in a healthy body. We will suppose they have progressed somewhat in their study of anatomy through the mouth, the stomach, the circulatory organs, the veins and arteries which connect with the heart and lungs. We will suppose the boys and girls have learned how the blood finds its way into every "nook and cranny" of the body, then would be a good time to ask them whether or not alcohol will also find its way into every "nook and cranny" of the body? They will clearly see that it *will* come in contact with every tissue and have its chance of producing serious results. They will be able to

determine the various organs which would be met by the alcohol. They would see that alcohol would be mixed in the stomach with the digestive juice. And now, if a little artificial gastric juice could be brought before the class and alcohol added to it and the effect could be noted, the boys would be ready to appreciate it clearly.

If, for example, they should put a little alcohol in a test-tube containing a small amount of gastric juice and see that the result was the separation of certain solids, the precipitation of certain parts of the gastric juice, that therefore these solids would be in no way capable of digesting the food.

Again, a little ether or alcohol might be placed upon the hand and its effect noted. Put a little ether upon the hand and allow it to evaporate. By it the hand is rendered cold and numb or in other words, it is paralyzed. Now, to rightly understand that, one would have to understand the nervous systems. We have two nervous systems, the cerebro-spinal system, and the sympathetic nervous system. The cerebro-spinal system consists of the brain, spinal cord and nerves. The sympathetic system consists of two rows of nervous ganglia, little brains, one on each side of the spinal column which sends branches to all parts of the skin, and in fact, to all the internal organs. Now the mucus membrane of the stomach besides containing the gastric follicles, is also filled with blood vessels. The walls of these blood vessels are made of muscle and have the power of contracting. The blood is forced on by them, but mind you, a muscle never contracts without it is stimulated to do so, without a nervous impulse. Now, suppose the nerves which control these muscles are paralyzed; the muscle cannot contract. The blood surges in, and there is no power of contraction by which it can be forced on. The blood vessels are thus very much enlarged and the blood is sometimes forced to ooze out through the walls of them. In some such way, a teacher might make clear to a class of boys, the effects of paralyzing the sympathetic nerves. There are also many charts that can be procured and shown to our pupils in school, showing the effect that alcohol has upon the internal organs. There is one showing the stomach of a man after he has died of delirium tremens.

These charts are printed in colors showing the exact tint belonging to every part, so that the effects may be clearly appreciated. But taking alcohol in moderate drinks even a single dose of alcohol will produce this effect upon the mucus membrane of the stomach. When the stomach of a confirmed drunkard is examined, it is found that these blood vessels are not only very much enlarged, but the blood is oozing out of them rather than taking matters up out of the stomach. This is an explanation of the black vomit which is common among drunkards.

It seems to me that that point could be made clear to the boy, until he would be made to say, that for him, no such stuff as that should touch the inside of *his* stomach, no matter whether it was prescribed by the physician, or whether it was handed to him by the allurements of some friend, nothing should be the occasion of his bringing this stuff in contact with his stomach.

I would, if I owned a microscope, put a drop of blood under it, and note the effect which alcohol would have upon the blood corpuscles. The alcohol causes these corpuscles to become shrunken.

I would make that very clear to the boy that when he has inserted this alcohol into his system he is in danger of the fatal result which may end in his death.

So, I urge upon our teachers to pay some attention to this subject. They may show our boys that there is a great deal more common sense in the dissemination of knowledge on this subject than we, in this generation have had.

SANITARY PROGRESS.

BY A. M. MILLER, M. D., ALPENA, MICH.

Sanitary Science, or the study of the origin and prevention of disease, is of comparatively recent origin. Up to the present century it was but little understood. It is true that we find graphic descriptions of pestilence and disease from the Bible up to the present time. The learned Greeks often assailed the people about their ignorance, and depicted the physical degradation of the times. The Romans gave it more or less of their attention, and the people were often aroused to inquiry as to the prevalence of pestilence, sickness and death. But ignorance of the laws of health, and the prevailing superstition of the times prevented any attempt at advancement. Disease was thought to be caused by demons, and the outbreak of disease and pestilence was looked upon as a visitation of the wrath of God. But what was the result of such ignorance and unaccountable prejudice? Repeatedly, whole cities and countries were depopulated and scourged, sometimes, until only one-half of the original number remained to lament the sorrowful past.

In the middle ages Asia, Africa and entire Europe were visited with the black plague, called the black death on account of the person sick with it turning black. Germany, France and Italy were near destruction, the people dying daily by thousands. London at this time was without sewerage or water-supply, a regular hot-house of filth. The people lived in the low huts without ventilation, and with rushes for a floor. When one layer of rushes would become too filthy for comfort, they would spread another layer on top. As a result, the plague visited them and over 100,000 succumbed to this dreaded disease.

But the old country alone has not suffered from ignorance and superstition; cities of our own beautiful country have mourned the visit of cholera, small-pox and yellow fever.

Civilization is said to advance in proportion to the improvement of the sanitary condition of man, and thanks to the perseverance of a few progressive, public spirited men, and the untiring work of the State and local boards of health, man is beginning to recognize the value of public cleanliness and sanitary measures in the elevation of mankind and the prevention of the causes and spread of disease. Then again, the people are beginning to appreciate the valuable work done in our hygienic laboratories in the study of the origin of disease, for they see the advantage gained in the treatment and prevention of a disease when its origin becomes known. The enlightenment from the study of hygiene comes from the correct interpretation of nature's laws. In the study of surgery we are taught to observe nature's methods of repair in the healing of a wound or fracture. We see nature filling in the gaping wound with granulated tissues, we come to her aid and draw the edges of the wound together with a suture, and nature does the rest of the work. So it is everywhere with life;

when there is destruction of healthy tissue or an abnormal condition produced, there is the inherent power of repair in whole or in part.

The natural condition of man as best exemplified in the Garden of Eden was that of cleanliness, but men crowded together in houses and cities surrounded by their own excretions, become unclean and unhealthy. Sanitary science and sanitary conventions try to point out the best way to get rid of refuse and filth, to obtain pure water, health and happiness.

During the seventeenth century the average duration of life was 23.8 years, while at the present time as the result of our knowldge of sanitary science, an average individual may reasonably be expected to live 49 years. What an achievement is this, and what a boon for succeeding generations to accept! It is said on good authority, that if man would but live in harmony with nature, 100 years would be attained as the average duration of life, and the time is coming, when the people will not so much procure the services of physicians to *cure* them of disease as to *prevent* it, when he will more often be consulted for the correction of some existing evil tendency or hereditary taint. Then man will be able to reach his ideal state of perfection of both body and mind. But this evolution will be a slow one as seen by looking back over the pages of history, "man's inhumanity to man" and almost "criminal indifference" are the great stumbling blocks to progress.

They say history repeats itself. Galileo proclaimed the world was round, that it rotated on its axis, that it revolved around the sun. He was called a crank. The people were indignant, so they caught him, made him recant and cast him into prison. Socrates taught an advanced system of moral philosophy with the same result. The people got him and killed him by making him drink a cup of the deadly hemlock. It is said that when Dr. Wyman, in 1847, introduced a bill in our own State legislature to drain the swamp lands as a sanitary measure, he was scouted as an enthusiast and crank, to think of curing fever and ague with drains, people declaring it would be a useless expense. The bill was passed, and history shows that no more important law has been enacted by the State.

Ascribing all honors to William Jenner for the discovery of vaccination, one of the greatest discoveries the world has ever known, and to other sanitarians that have been influential in controlling the terrible plagues, we call your special attention to the prevalence of these other diseases that are nearly always with us and yearly causing a hundred times as much sickness and deaths, as cholera, small-pox and other historic plagues combined. I refer to consumption, typhoid fever, diphtheria and scarlet fever, these four plagues that attack the high and low, young and old, rich and poor.

How many are there among you who do not remember of watching by the bedside of a beloved one sick and perhaps dying of one of these dread diseases yet so few will give a dollar, or any encouragement to the sanitarian in his efforts to prevent them.

According to the U. S. census for the year 1879, 91,270 died of consumption, over 40,000 of typhoid fever, 38,000 of diphtheria, and 16,388 from scarlet fever. Think of it, more than 185,000 deaths each year from these four diseases that are largely preventable. And for every death there are at least ten sick, so you can then imagine the pecuniary loss to the country in an amount which, if honestly expended in the prevention of disease, would reduce the sickness and deaths to one-quarter for ten years. This may seem a little overdrawn, but I submit a report made by

Dr. Baker, at a sanitary convention held at Vicksburg, Michigan. He says: "The record of the great saving of human life and health in Michigan in recent years is one to which, it seems to me, the State and local boards of health in Michigan can point with pride. It is the record of the saving of over one hundred lives per year from small-pox, four hundred lives from scarlet fever, and nearly 600 lives per year saved from diphtheria, an aggregate of 1,100 lives per year or three lives per day, saved from these three diseases.

"This is a record which we ask to have examined, and which we are willing to have compared with that of the man who made two blades of grass grow where only one grew before."

How does Dr. Baker find this out? In this way: The State Board of Health is in direct and constant communication with the local boards that have been established in nearly every village and township in this State. The local boards are authorized to report every outbreak, the number of cases and the number of deaths; and it is found that where sanitary restrictions of isolation and disinfection are enforced, one-quarter as many cases and one quarter as many deaths occur as where they are not observed.

The first duty of government is to increase human liberty and protect human life, but what has been done to stop this wholesale slaughter every year? "The United States Government has spent more for the study of hog cholera than for all the diseases man is heir to."

Do you know that over twenty-six per cent of the children born the world over die before they reach five years of age? Looking over the statistics for 1880 we find about 65,000 die yearly from diarrhœas that are largely due to the ignorance of the care and bringing up of children. But what is this great and good country doing in the way of caring for and protecting the growth and development of its infant sons and daughters upon whom depend the country's glorious future? The government will spend thousands of dollars in developing a new breed of horses, but its infant sons and daughters are left to grow up in squalor and filth, breeding crime and imbecility. It seems to be a question of the "survival of fittest."

The perplexing question to the ordinary individual of the use of statistics is an important one. To the sanitarian, they are of incalculable value; they show to him, 1. That where the rules of sanitary science have been carried out, there occur one-quarter as many cases and deaths in an outbreak as where they are not observed. 2. That as soon as cities obtain improved sewerage and water-supply, the death rate is at once and continuously lowered in that city. 3. That through the meteorological observations throughout the country, he can predict at what time of the season and under what conditions of atmosphere and temperature, certain diseases will be most prevalent. 4. That enforcement of the recognized laws of sanitary science lessens the amount of sickness and death rate generally, increasing the prosperity and happiness of the people.

It is only through knowledge of the number of the afflicted, and of their conditions of life, that any thorough and systematic methods of lessening the number can be devised, hence the object of the bill passed by Congress authorizing census takers to report the number of afflicted and their conditions of life that, it may aid sanitary progress.

Time will not permit me to further point out how the sanitarian has been useful to the public, and how he has revolutionized the practice of

medicine by his discovery of the germ theory of disease; how he is every day working out of the great chemical laboratory of nature some new idea that will aid in the restriction and treatment of disease; how he is successfully learning to combat the great questions of increasing population and crowding in cities; how he is teaching that every citizen is morally responsible for his own health, for the health of his children and his neighbor; how the physical purification of the individual is the first step toward public health, and how this is best obtained by teaching each individual to care for his own bodily welfare in childhood, in youth and in adult life.

A reasonable deduction from the foregoing facts seems to make it morally incumbent upon each and every citizen of Alpena to do his best in encouraging and aiding in making this one of the safest and healthiest cities in the State; making it foremost in this respect as it is foremost in other respects.

Knowing that lives are saved every day of every week and of every month, how can we hesitate to balance dollars and cents against the encouragement of such work which pure humanity should prompt us to do. The value of a live man in cold cash is estimated at $1,000, and not considering the expense of sickness and burial, how much money would be saved to the city every year, by paying an efficient health officer a good salary to prevent three-fourths of the amount of sickness and deaths from communicable disease, beside the amount of sickness and deaths from other diseases? Supposing there were but three persons a year saved, we could afford to pay $2,500 for sanitary work, and then make money. It seems worse than barbarous to sit quietly by with our hands within our pockets as long as there is a single being in God's image that can be saved from a premature grave.

If we would be a prosperous and happy people, we must first of all be healthy, and we can not bring the standard of health in this city up to what it should be without an efficient, well paid health officer at the head, coöperating with live and intelligent citizens, leaving no stone unturned in destroying the germs of disease.

And to the members of the State Board and others who have honored us with their visit here, as a suitable reward for their trouble, we ask them to look to the future of Alpena if they wish to see how we profited by their teachings.

THE RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES, FROM THE STANDPOINT OF THE STATE BOARD OF HEALTH.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING, MICHIGAN.

MR. PRESIDENT, LADIES AND GENTLEMEN:—Inasmuch as it is known that the State Board of Health utilizes the vital statistics of Michigan, and the title of my paper is—"The restriction and prevention of the dangerous communicable diseases, from the standpoint of the State Board of Health"—this may lead some of you to ask:—what are the communicable diseases most dangerous in Michigan? And, how much danger is there in Michigan from those diseases? Correct answers to these questions will enable us to know whether it is worth while to take the trouble to learn just how to restrict or prevent them. But, before I answer these questions, I suppose you will all or nearly all admit that small-pox is a dangerous communicable disease, and that it is worth while for every intelligent person to know just how that loathsome disease may be avoided. Therefore, I wish, first of all, to mention what we consider the best measures for the prevention and restriction of small-pox, and to express my belief, and the belief of the medical profession throughout the world, that, by means of vaccination, and re-vaccination once in about five years, small-pox may be almost entirely prevented. That would dispose of this part of my subject, if the people would all avail themselves of the protection of vaccination, accurate knowledge of which, an eminent British sanitarian has said "is beyond all comparison, the greatest practical good with which medical science has enriched us." * Unfortunately a large proportion of our people, through ignorance or carelessness, fail to accept this "greatest practical good with which medical science has enriched us"—fail to *prevent* small-pox by vaccination; therefore, it becomes necessary to know how to *restrict* small-pox.

For the restriction of small-pox it is essential:

1. That the local health officer shall have notice of the occurrence of a case as promptly as possible. He should have notice about as promptly as the fire department has of the occurrence of a fire.
2. The local health officer should promptly isolate all infected persons and things, and keep them isolated until freed from infection.
3. The local health officer should offer the prompt vaccination or re-vaccination of every person exposed to small-pox who has not been recently vaccinated, or who has not recently had the small-pox. No such person should fail to be vaccinated as promptly as possible.
4. The local health officer should have continued supervision of every case of small-pox until complete recovery or death.
5. After death or recovery of the patient, the local health officer should thoroughly disinfect all infected premises and things.

But is small-pox the most dangerous communicable disease in Michigan? It is not. If vaccination should be generally neglected, it might become

* John Simon, Public Health Reports, 1887 vol. I., p. 282.

so, but the experience in Michigan during the past twenty years proves that there are several communicable diseases which are far more dangerous in Michigan. Even whooping-cough has, during the past fifteen years, caused many more deaths than small-pox.

Whenever the people generally agree that they will coöperate for the restriction of whooping-cough the health authorities of the State will undoubtedly coöperate, and scores, perhaps hundreds of valuable lives will be saved in Michigan in every year.

But, to return to the question—What are the greatest dangers to life in Michigan? Named in the order of their importance, the one that causes the most deaths first, the five diseases which cause most deaths in Michigan are: (1) consumption, (2) diphtheria, (3) pneumonia, (4) typhoid fever, and (5) scarlet fever. Pneumonia is probably a communicable disease, but we are not yet prepared to enter vigorously upon its restriction, but you will see that all of the most fatal and important diseases in Michigan are communicable diseases, all are, in some way, spread from person to person.

We thus gain some idea of the vast importance of this subject—the restriction and prevention of the dangerous communicable diseases, which include all the most important causes of death in Michigan. I fear, however, that few people in Michigan really have any fair idea of how important this subject is. Let us examine it a moment: In the first place we absolutely know that a large proportion of the cases and deaths from the most of these diseases are *preventable*, and I believe that this is true of all of these diseases.

COÖPERATION NECESSARY FOR THE RESTRICTION OF DISEASES.

For this, however, it is necessary that all the people shall coöperate. No one can fully protect himself so long as others do not understand the subject and act accordingly. Therefore, the only way these most important causes of death can be most completely avoided by any of us, is by increasing the proportion of the people who know how to restrict and prevent them. If we except small-pox, which may, by vaccination, be avoided by each person for himself, this statement is true relative to each of the dangerous communicable diseases—for the restriction of each there is required general diffusion of knowledge, and general coöperation of all classes of people. That is a good reason why "the restriction and prevention of the dangerous diseases" is given so prominent a place on the program of every Sanitary Convention.

HOW THESE DISEASES ARE SPREAD.

But these diseases are not all spread in the same way, and it is necessary that the people generally shall know how each one is spread, in order to know how to restrict each disease. In each disease something goes, from a sick person, which is capable of causing the disease. It goes from that part of the body in which the disease is located, and generally it thrives best when it reaches that same part of the body to which it goes. In consumption that part is generally the lungs, and the specific cause of consumption goes out with the sputa, and is scattered about not only wherever the moist sputa goes, but also wherever the dust from the dried sputa goes. And, as the dust of the air is breathed in with the air inhaled, there is opportunity for

the specific cause of consumption to go at once to the part of the body in which it is usually found.

This indicates what is the most important measure for the restriction of consumption—namely, the *destruction or disinfection of all sputa from every consumptive person.*

But this subject has been sufficiently dealt with by the speakers who have preceded me.

TYPHOID FEVER.

Typhoid fever causes about ten times as many deaths in Michigan as small-pox does, probably about one thousand deaths per year, and most of these deaths should be prevented. The greatest number of deaths from typhoid fever is of persons in the prime of life, and this should prompt to greater efforts for the prevention of this disease.

The most common modes of spread of typhoid fever are not the same as of small-pox, and of consumption, consequently the measures for its restriction and prevention are not the same. The pamphlets on this subject issued by the State Board of Health, and freely distributed here, contain plain directions how to prevent typhoid fever, and how to restrict its spread in communities. It it now believed that typhoid fever is most frequently spread by means of the drinking water, that the microscopic cause of the disease is probably reproduced in the intestines of persons who have the disease, and that the specific cause gains access to the drinking water by filtering through the soil, and sometimes by being washed into wells or streams from which the drinking water is drawn. The noted instance at Lausanne, Switzerland, where the discharges from typhoid fever patients were thrown into a small stream, which disappeared by sinking into the earth and gravel, and reappeared about a half a mile distant as a mountain spring, the clear water of which caused typhoid fever in 144 persons, is instructive, and is useful for us to hold in mind as illustrative of how the disease may be spread. The most usual mode of spread is by way of the privy vault and the neighboring well. The facts concerning the outbreak at Lausanne prove (and the same has been indicated in other instances) that the cause of typhoid fever sometimes passes great distances by way of the underground water flowing through strata of gravel. We must not forget, however, that typhoid fever may be spread through the air, that the supposed "germ" of the disease is not destroyed by once freezing, and is not yet known to be destroyed by ordinary drying. We know that the microscopic "germ" of consumption is most dangerous when dried and floating in the air we breathe. It may be that the specific cause of typhoid fever is dangerous in the same way.

The prevention and restriction of typhoid fever requires the disinfection of all bowel discharges from those sick with such disease, and constant watchfulness of the sources of supply of water for drinking and culinary purposes. All water from a suspected source should be boiled before its use. Numerous instances are recorded where typhoid fever has been spread by the rinsing of milk cans with water apparently pure, but really infected with the germs of typhoid fever, capable of infecting the milk. This teaches us the importance of having water free from typhoid infection for all household purposes.

There is not time at my disposal to give all the evidence proving the enormous saving of human life from the ravages of typhoid fever which in

"CHART I.— DEATHS from TYPHOID FEVER to each 10,000 INHABITANTS before, during, and since the INTRODUCTION of SEWERAGE & WATER-SUPPLY.
No. of Deaths to 10,000
Munich.
Manitic
Breslau.
Frankfort
Berlin.
Vienna
Brussels
London
Larger Eng. Cities
England
N.Y. City.
Boston.
Brooklyn.
21
20
19
18
17
16
15
14
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12
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10
9
8
7
6
5
4
3
2
1
13.5
12.0
10.0
10.2
9.2
9.7
9.2
8.6
7.6
7.4
6.9
4.5
4.3
4.9
4.9
3.8
3.7
3.5
3.5
3.2
2.9
2.9
2.2
2.1
1.6
1.5

recent years has been accomplished because of such knowledge as this to which I just alluded; but I wish briefly to refer to some of this evidence. In a pamphlet published by the Michigan State Board of Health, and entitled "The influence of sewerage and water-supply on the death-rate in cities," Mr. Erwin F. Smith, shows conclusively very great reductions in the mortality from typhoid fever in many of the great cities in this country and in foreign countries, the reductions in the typhoid mortality following the introduction of systems of swerage and general water-supplies. For instance, in the city of Munich the death-rate from typhoid fever in the period from 1854 to 1859 was 24.2 per 10,000 inhabitants, while in 1884 it had declined to 1.4 per 10,000 inhabitants; that is, before the city was sewered, and while it was supplied with water from wells, the mortality from typhoid fever was about seventeen times as great as it was after the city was well sewered and had a good general water-supply.

To give you a mental image of this important subject, I have had copies made of two diagrams prepared by Mr. Erwin F. Smith to illustrate his paper, and they are here for distribution to such of you as will study them.*

Typhoid fever is a disease which, in my opinion, it is important that citizens of Alpena should understand, because of the nature of the soil, and earth underlying this place. Sooner or later there will come a time when no ordinary well in such a place can be safely relied upon to supply water free from the specific cause of typhoid fever.

But the general water-supply of cities and villages is a matter of the greatest concern, and it should be procured from places where there can be no probability of immediate or remote contamination. The well-known outbreak of typhoid fever at Plymouth, Pa., where over a thousand cases and 114 deaths occurred, is apparently an illustration of how great a calamity may follow the fouling of a *general* water-supply by the discharges of a person sick with typhoid fever.

If there should be in Michigan such a reduction of the mortality from typhoid fever as was secured in Munich through better sewerage and water-supply, there would be a saving of over nine hundred lives per year, and over nine thousand cases of sickness per year.

To point out how such favorable conditions for healthful existence may be secured, is one of the objects of such Sanitary Conventions as this.

Let us now pass to the consideration of diseases which are fatal chiefly to children.

DIPHTHERIA.

About eighty-five per cent of all the deaths from diphtheria are of children under ten years of age. Grown people have diphtheria, but it is usually considered as only an ordinary sore throat, and proper precautions to prevent the spread of the disease are not taken. This ought to be generally known, and many more lives can be saved when all our people come to understand the facts.

In Michigan, diphtheria causes about seventeen times as many deaths as small-pox does. I think diphtheria is probably more contagious than small-pox; because the spread of diphtheria is not usually so easy to trace, and yet we know that diphtheria is contagious, because it is sometimes very easy to prove this, and to trace its mode of spread. Diphtheria seems to be more frequently spread by indirect means than small-pox is, because if it were not, we ought to be able to trace the spread of diphtheria as easily as we do

* Charts I. and II. Chart I is printed on page 74.

the spread of small-pox. But whether diphtheria is more or less contagious than small-pox, one important reason why we suffer so very much more mortality from diphtheria than from small-pox is the fact that for diphtheria we have no such preventive measure as vaccination.

Diphtheria is prevented by keeping away from where the disease is, and from everybody and everything that has been near the disease, keeping away until everything has been disinfected. In order that this shall be possible it is essential that every place where diphtheria is shall be promptly reported to the health officer, and plainly placarded. The law requires the local board of health to "give public notice of infected places", and to "use all possible care to prevent the spreading of the infection". Another law requires the health officer to "give public notice of infected places by placard on the premises, and otherwise if necessary". Common humanity requires of every person that he do his utmost to fulfill the letter and spirit of all such laws for the public safety against such a terrible disease as diphtheria.

The law was amended at the last session of the legislature, and its provisions should be generally known. Every householder, hotel keeper, keeper of a boarding house or tenant is required, to report, to the local health authorities, diphtheria and any other disease dangerous to the public health, and whoever fails to do this is liable to a fine and to imprisonment if the fine is not paid. Physicians are required to report, and if the physician reports the householder is excused from that duty. Health officers, unless otherwise ordered by the local board of health, must take prompt, thorough, and efficient measures to stamp out the disease; and if they neglect their specified duties they are liable to a fine and to imprisonment if the fine is not paid.

But however good the laws may be, their execution depends upon the enlightened sentiment of the locality, upon the people themselves, from whom the prompt notice should go to the local health officer, and upon intelligent and faithful local officers who should perform duties which are of the highest importance to the people. For obvious reasons, the compensation of the health officer should be greater than he can obtain for the same time by the regular practice of his profession as a physician,—the highest interests of the public demand that he shall have a greater money interest in the prevention of sickness than in the treatment of sickness which should have been prevented.

There is one more requirement for the restriction of all those dangerous diseases. It is a delicate point to mention, but it is important that the physicians around the State shall be able to know one of these diseases when they treat it. The fact is, that in each of the outbreaks of small-pox in recent years that have spread, the doctor called to treat the disease did not recognize it—called it chicken pox. It is a common thing for scarlet fever and diphtheria to be treated as some harmless ailment, and consequently be allowed to spread. Typhoid fever is, sometimes, not recognized and reported to the health officer. All this indicates that the greatest safety of the people would require that all who advertise or set themselves before the people as practitioners of medicine should have certain qualifications,—they should be required to know the characters of the most common and most fatal diseases, especially those which are communicable and which therefore always endanger the public.

If you think as I do on this subject you can ask the legislature to give you such a law. My own duties are mainly with the execution of laws, but

in the performance of those duties we sometimes see or think we see how the laws might be improved.

SCARLET FEVER.

Scarlet fever is a disease to be dreaded on account of the mortality which it causes and also on account of the permanent injuries which result from it. Thus, as an instance, of 263 pupils in the Michigan School for the Deaf, at Flint, during the years 1887–8, who became deaf since their birth, the loss of hearing of 42, or 16 per cent, is attributed to scarlet fever*. Of the 114 pupils in the Michigan State School for the Blind, at Lansing, during the two years 1887–8, who became blind since their birth, 6.1 per cent lost their sight from the effects of scarlet fever.†

In Michigan, scarlet fever causes about nine times as many deaths as small-pox does. The only *preventive* is to keep away from the disease and to allow no person or article infected with scarlet fever contagium to come near a person susceptible to that disease.

For its restriction, except that there is not vaccination, all the measures proper in the case of small-pox are proper in scarlet fever.

Inasmuch as scarlet fever causes nine times as many deaths as small-pox does, the importance of prompt notice to the health officer is at least nine times as great as it is in small-pox.

All the other measures should be promptly and thoroughly executed. I will stop to give you details. They are published in our pamphlets here for distribution.

Practical Results in Restricting Scarlet Fever.

At the close of the year 1887, the statistics published by the State Department, showed that the mortality from scarlet fever in Michigan has been reduced in the years when the measures recommended by the State Board of Health have been to some extent fulfilled, so that over five thousand six hundred persons had lived who under the old mortality rate, before the Board began its work, would have prematurely died. This is an average saving of over four hundred lives per year—rather more than a life every day for fourteen years, saved from that dread disease, scarlet fever.

But we have other evidence than the mortality statistics, showing the great saving of life which it is possible to have in Michigan through such measures, for the restriction of scarlet fever, as I have briefly outlined. The experience of the local health officers in restricting scarlet fever in this State is reported each year to the State Board of Health; and a compilation of these reports shows that in those outbreaks in which isolation and disinfection were neglected there were about five times as many cases and about five times as many deaths as in those outbreaks in which they were enforced.‡

This is about equivalent to saying that four-fifths of the cases and deaths from scarlet fever are known to be preventable through measures which we can describe in three words—*isolation and disinfection.*

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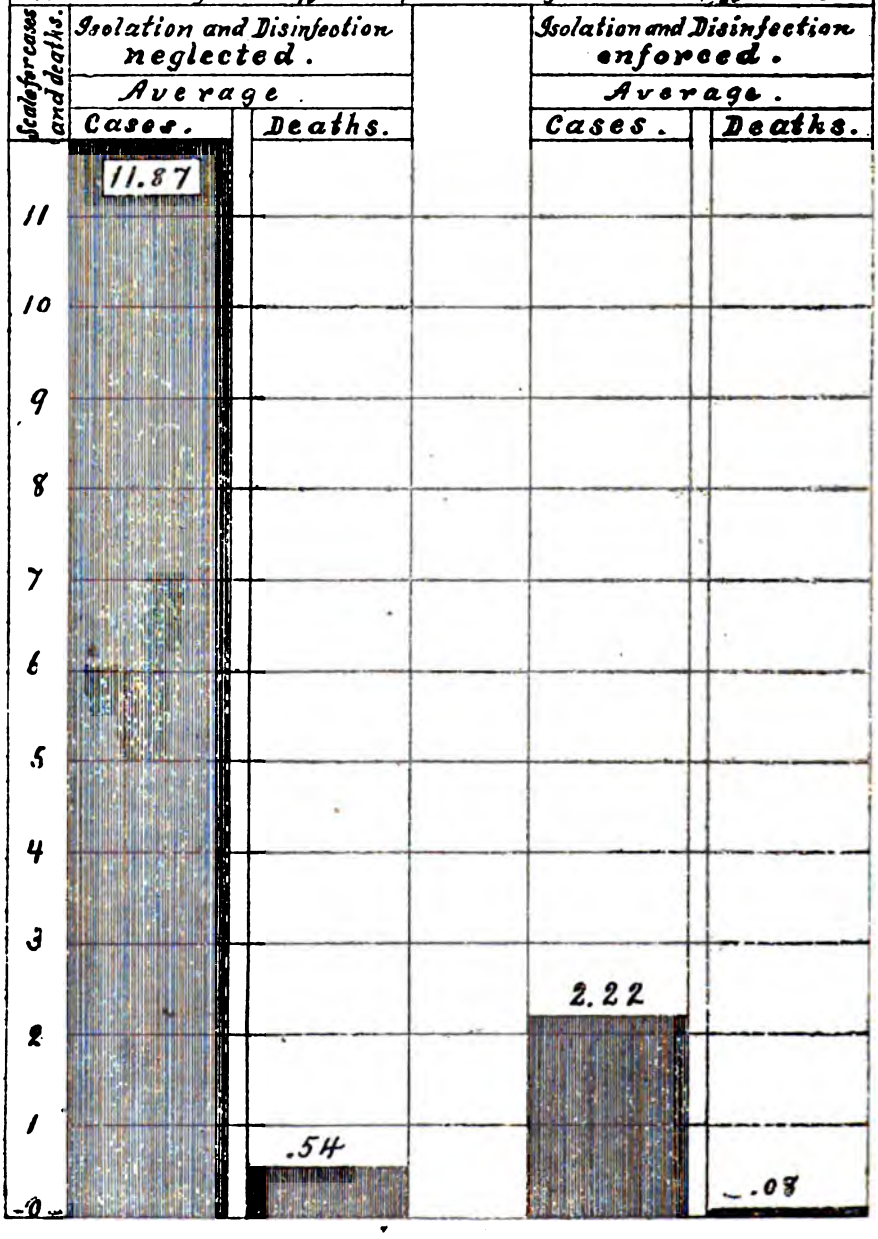
* Eighteenth Biennial Report of the Board of Trustees of the Michigan School for the Deaf.

† Report of the Superintendent of Public Instruction, Michigan, 1888, page 78–80.

‡ The evidence for one year, 1888, is shown in the diagrams distributed here. Printed on page 78.

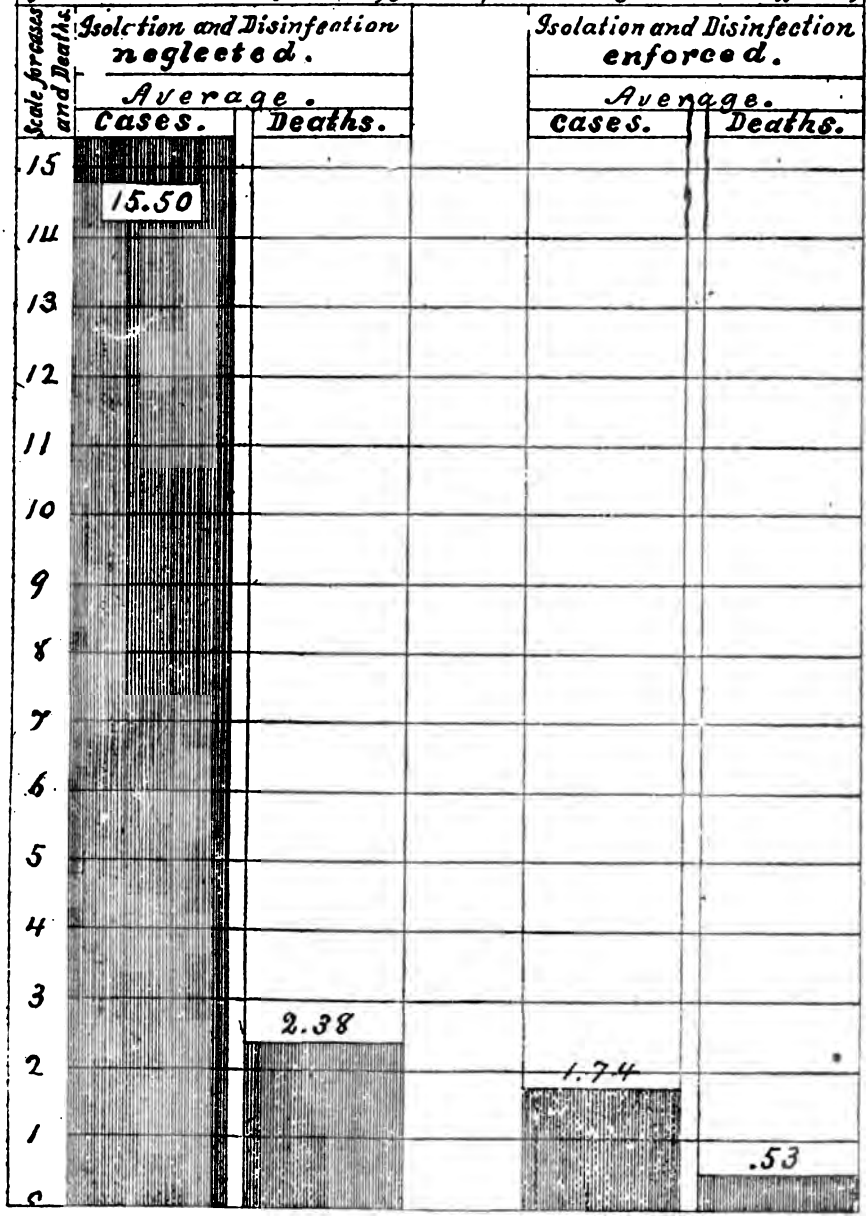
ISOLATION AND DISINFECTION RESTRICT SCARLET FEVER.

Scarlet Fever in Michigan in 1888:- Exhibiting the average numbers of cases and deaths per outbreaks- in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



ISOLATION AND DISINFECTION RESTRICT DIPHTHERIA.

Diphtheria in Michigan in 1888:- Exhibiting the average numbers of cases and deaths per outbreak:- in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



Practical Results in Restricting Diphtheria.

While on the subject of the saving of life in Michigan, I may mention that the experience of the health officers in restricting diphtheria in this State is also reported each year to the State Board of Health, and a compilation of these reports shows that 833 lives were saved and 4,374 cases of sickness prevented from diphtheria in Michigan during the year 1886, and that in the year 1887, 518 lives and 2,371 cases of sickness prevented; during 1888, 416 lives were saved and 3,292 cases prevented. Thus, during the three years 1886, 7 and 8, over ten thousand (10,037) cases of sickness were prevented, and more than seventeen hundred (1,767) lives were saved from diphtheria in Michigan. Or, another way of stating this is to say that during the last three years the *known* saving of life in Michigan from diphtheria has averaged one and a half persons per day.*

Practical Results in Restricting Small-pox.

The statistics collected and published by the Secretary of State of Michigan, taken in connection with the facts on record in the office of the State Board of Health, prove that in Michigan, through such measures as I have outlined, the mortality from small-pox has been reduced, and that if it had continued at the same rate as before the State Board of Health was established, more than one thousand five hundred persons in Michigan would have died from small-pox that have not died of that disease. This was true at the end of the year 1887, and since that time the mortality from small-pox in Michigan has not increased. The statistics now cover so many years that we think there can be no doubt of the reliability of their evidence.

The success which has already been achieved in dealing with scarlet fever, diphtheria and small-pox should encourage all to more thoroughly coöperate for the restriction of those diseases, and also to enter vigorously upon the work of restricting typhoid fever and consumption. The relative importance of these diseases can be seen by the diagram which is exhibited here.† I believe that one hundred lives per year have been saved from death from small-pox. The diagram is accurately drawn to a scale, and correctly represents the relative mortality in Michigan from these important diseases, which we believe are largely preventable. You can see for yourselves how much more important than small-pox some of the other diseases are, and the tremendous opportunity which there is for life-saving work for the restriction and prevention of the dangerous communicable diseases in Michigan. I do not see how one can have a better field or a nobler work, and I trust we shall all do what we can in this direction.

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* You may be interested to know the method of estimating the number of cases prevented and lives saved by means of isolation and disinfection. It is as follows: Multiply the *whole number* of outbreaks by the average number of cases and deaths in the *neglected* outbreaks and the product is the probable number of cases or deaths which would have occurred if *all* outbreaks had been neglected. Deduct from this the number of cases or deaths which actually occurred, and the remainder is the indicated number of cases of sickness prevented or lives saved by the efforts made to restrict the disease.

As the local health officers report to the State Board of Health the number of cases and deaths in outbreaks of diphtheria, and also report just what was done (in each outbreak) to restrict the disease, we are thus supplied with the data necessary to learn the success which attends any line of action which is taken. The diagram on page 79 exhibits the experience in restricting diptheria in Michigan in 1888.

† Diagram "Deaths in Michigan, 1876-87," page 81.

DEATHS IN MICHIGAN, 1876-'87.
CONSUMPTION.
DIPHTHERIA.
TYPHOID FEVER.
SCARLET FEVER.
WHOOPING-COUGH.
MEASLES.
SMALL-POX.

5-162.77

MERICAN

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

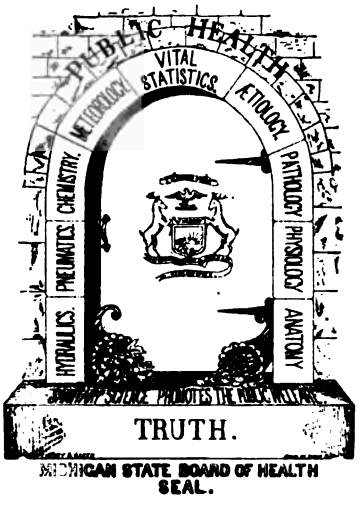
CHARLEVOIX, MICHIGAN,

AUGUST 14 AND 15, 1890,

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF CHARLEVOIX.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1891.

[REPRINT NO. 248.] 3



MICHIGAN STATE BOARD OF HEALTH SEAL.

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1891.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

CHARLEVOIX, AUGUST 14 AND 15, 1890.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH
FOR THE YEAR 1891.

[No. 348.]

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

CHARLEVOIX SANITARY CONVENTION.

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PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT CHARLEVOIX, MICH.,

AUGUST 14 AND 15, 1890.

SUPPLEMENT TO REPORT OF THE MICHIGAN STATE BOARD OF HEALTH, FOR 1891.

This Convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Charlevoix, acting with a committee of the State Board of Health.

The following named persons constituted the various committees:

Committee from the State Board of Health.—Henry B. Baker, M. D., Lansing.

Local Committee.—Dr. Levi Lewis, Chairman; Dr. J. E. Brown, Dr. F. W. LeFevre, Rev. W. H. McCartney, Hon. E. H. Green, Hon. Fred W. Mayne, Hon. J. Milo Eaton, Hon. A. E. Mason, Robert W. Kane, F. A. Smith, S. M. See.

Committee on Music.—Robert W. Kane.

The officers of the Convention were as follows:

President.—Hon. John Nichols, Charlevoix.

Vice Presidents.—Hon. A. Buttars, Charlevoix; Hon. J. Milo Eaton, Charlevoix; Dr. Alfred J. H. DeLacey, Boyne City; A. J. Stroud, Horton's Bay; Dr. T. Lewis, Norwood; Dr. W. A. S. Williams, Petoskey; Dr. L. D. Bartlett, East Jordan; A. B. Steele, Advance; R. A. Miller, Ironton.

Secretary.—R. W. Kane, Charlevoix.

FIRST SESSION—THURSDAY, AUG. 14, 1890, AT 2 P. M.

The convention was called to order by the President, Hon. John Nicholls.

After music by Mrs. Aldrich of Chicago, and prayer by Rev. Mr. Hayne of Charlevoix, A. E. Mason, President of the village, gave the following address of Welcome:

Ladies and Gentlemen:

I thank you for your attendance here today; you who reside in this village and you from abroad. It shows your interest in the welfare and good health of the people of the village of Charlevoix and State of Michigan. I believe that the subjects to be discussed here are of vital importance to

all of us, and if we profit by the advice given by local speakers and the State Board of Health, much good can be accomplished. These gentlemen have made a specialty of these subjects of sewerage and water-supply, of ventilation, and prevention of disease, thus prolonging life.

Gentlemen of the State Board of Health, I welcome you as preservers of health, and I hope that you will not only benefit us, but will be recuperated yourselves. You are the guardians of health of the people of the State of Michigan, and if we, as wards, do not profit by your advice, it is our fault. Again I welcome you to our pretty little village, and hope that you will be more than repaid for the good you do.

RESPONSE AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

BY HON. JOHN AVERY, M. D., PRESIDENT OF THE STATE BOARD OF HEALTH, GREENVILLE, MICH.

Ladies and Gentlemen:

We have come some distance to meet with you in this convention, and I am requested to state to you its object. It is not a convention of physicians and scientists; it is not a convention of learned men to discuss matters of science, but it is a convention of the people, and in the interests of the people, and the subjects to be discussed are for the consideration of all classes. They are of more vital interest to the people than any other question that they can possibly consider—the questions of individual and public health.

I know that a great many people are under the impression that this convention is composed of ministers, doctors and scientists. We are glad to see every physician present, every minister, because we know that they are all interested in every good work that pertains to the preservation of the health of the people. We are glad to see every class of citizens present, and glad to see the people of intelligence who are interested in the growth, and prosperity and welfare of the city present, for this, then, is a convention of the people.

Now the members of the State Board of Health are here to give you such information as they possess. As the people become interested in the subject they sustain the efforts of the State Board of Health and the local health officers throughout the State of Michigan. We find that there are certain subjects that all believe in. Now I believe that if a case of small pox were to break out in this resort it would drive all the resorters away; they would take the next boat. Why do they leave? Simply because they know that small-pox is a contagious disease. They know that when a case of small-pox makes its appearance in town that there were or had been preceding cases; they know that. We do not have any difficulty in the State of Michigan in preventing the spread of small-pox because we put the patient in the hospital and keep every person away from him; indeed the people protect themselves—they keep away. I have seen larger towns than this fenced in because they had a case of small-pox. They would close up the schools and churches and would not let people go into or out of the town. What people want to know is that there are other diseases just as contageous as the small-pox, and ten people die in the State of Michigan of other diseases where one dies of small-pox. The people do not have the same feeling in regard to other kinds of

disease. For instance: A case of diphtheria does not excite any special alarm, as in the case of small-pox. The people do not comprehend or understand that diphtheria is a disease that is as dangerous to public health as small-pox, and that twenty persons die of it where one dies of small-pox. Now we desire that people should have precisely the same knowledge about diphtheria, scarlet fever, consumption and typhoid fever that they have in regard to small-pox. When they understand that these diseases are communicated from one to another, they will become efficient aids to the State Board of health and local boards in the restriction and prevention of these diseases.

It is to enable them to understand what these diseases are that these conventions are held. If we shall succeed in interesting this community, we are satisfied that the interest radiating from it will be of more benefit to people outside than it is to the people of this beautiful health resort that you have here. I hope the people here will be interested in these conventions, take part and ask questions. We believe that we will have a successful convention and the benefits will be lasting in your town, and a benefit to the people of the State.

HOW AND WHERE A RESORT SHOULD BE LOCATED.

BY HENRY BISHOP, KALAMAZOO.

As to the location, the ideal summer resort should be on high, dry ground, on sandy soil, that it may dry out soon after a rain. It should be within a pleasant walk of a village of sufficient size to supply resorters with all needed family supplies, accessible to daily mail facilities, and where resorters can enjoy the privilege of attending church on the Sabbath. It should be readily reached by railroad, and have water communications with the other parts of the country, but it should not be near a large city or a railroad center where the saloons outnumber the churches and the school houses. It should have on the grounds places of amusement and hygienic accommodations sufficient to prevent the boys and girls from going to other places to gratify their desires for such recreation and amusements.

It should be bordering on lakes of sufficient size for all kinds of boating, but the row boat should be preferred, as the use of the oars hardens the muscles, expands the chest and affords sufficient pleasant healthy exercise, without taxing the brain, to offset the tendency otherwise of becoming too indolent to be beneficial to health. It also leaves them better fitted to resume their usual employment on going home at the close of the season. It should have a well conducted house of entertainment for strangers without putting on too much style, or too high charges for those whose stay is only for a few days. It should have a good dining hall where resorters not keeping house can procure meals at a reasonable price, and where a lady will be as much respected in a calico or gingham dress as she would be in more costly apparel. Many seek such places to restore health who can't afford or have no desire to put on the usual style of more fashionable watering places.

The ideal resort should have a good bathing house where warm and cold baths can be had, and also a place provided where boys and girls can learn to swim. Pine Lake is a beautiful, large body of pure water, and so shoal

for a long distance out from the beach that young children can safely wade round without danger of drowning, but I doubt if this kind of bathing is conducive to health. In the first place, they only use it on warm days, when the temperature of the body is too much heated to stand the cold water about the lower limbs while the head is exposed to the heat of the sun. Then they are apt to remain too long a time in the water thus exposed to cold below and heat above.

The lakes and rivers should be well supplied with fish, but not of the kind that will bite the small boy's hook or large numbers will be caught for sport to be thrown away.

The ideal resort should be provided with a large public hall where all the different religious societies (by invitation of the proper committee) should be allowed to conduct services on the Sabbath day, and for the use on all other days of resorters for all kinds of innocent amusements, and for public gatherings for mental improvement, and to become better acquainted with each other, for most resorters are strangers to one another, and are apt to remain so if they keep isolated within their own cottages.

It should have a level grass plat kept well mowed, and of sufficient size for ball playing, lawn tennis, and other out-door games, and athletic exercises in which both sexes should participate. Each cottager should cultivate a few flowers to beautify his lot, to furnish pleasant out-door employment for the ladies, and to make the place look more homelike and more enjoyable.

Of the necessity of resorts, and who should occupy them, and how best to look after the welfare of those who become residents for the summer season as well as the temporary patrons I leave for others to decide.

In starting a resort the first comers are like the pioneers in a new country anxious and willing to assist each other, until the place becomes crowded, then the village becomes a city, and the resorters too numerous to prevent innocent amusements from becoming dissipation, including gambling and all its attending evils. Then comes the time when wise councils come in play in weeding out all those things that render the place undesirable and unfit for the better class who desire to live more in accord with the laws of health and with nature's requirements.

DISCUSSION OF THE SUBJECT OF AN IDEAL SUMMER RESORT.

RT. REV. GEORGE. D. GILLESPIE, Grand Rapids:

I will say that my knowledge of resorts is confined to those in Northern Michigan. One plea is, the resorts are favorable to family life. The objection to the American man's mode of living is that he knows too little about his children. At the resort during the few months in the year fathers have the opportunity to gather their children around them. These are advantages which a summer resort gives over a hotel. I believe it is said that a hotel is not a very nice place for children. In these shanties, or cottages, as we call them, we are under no restraint; we can have even family devotions. There is another thing in favor of these summer resorts; it gives you the privilege to go as you please and do as you please. You know that if you go to Saratoga, or the Grand at Mackinac, a lady may not wear the same dress more than two or three times in the course of the week, if she is up to the fashionable standard. There is nothing of this kind in these resorts. I have seen no evidence here of what a woman called making

the toilet. In the life we live here there is no restraint. This kind of a life you cannot have in a fashionable hotel. And there is another point, and that is, that it does not require a very long purse. Not a great many years ago it was only the rich that could afford the summer outing, now all classes can enjoy a few weeks vacation during the summer season.

There are some of these resorts that have very instructive lectures, for instance, Bay View. I do not care to hear lectures myself, as I want real quiet, but I see how exceedingly valuable that is for teachers, students, and that class of persons. It is a credit to the people that there is such a place. I am not in favor of sectarian resorts. I did once think of getting up an Episcopal resort, but I have changed my mind. I do not think it is desirable to have a very large resort. For instance, in a large resort there are some who like to spend the Sabbath properly, and there are others who would make Sunday as any other day. A resort should give proper attention to sanitary matters, that it may become an ideal resort.

J. H. SMART, President Purdue University, Lafyette Ind.:

I regret very much that I was not able to come into the hall in season to hear Bishop Gillspie's discussion on "The Ideal Summer Resort." It is, however, my loss and possibly your gain. I am reminded of an old darkey preacher, who was called upon to open the proceedings of a convention with prayer. He performed the duty in this wise: "O Lord, bress de speaker ob de evenin', dat is, de *fust* speaker ob de ebenin'; but, O Lord, hab mercy on de second speaker ob de ebenin', 'specially if de fust speaker makes a good speech." Now I have no doubt the Bishop made a good speech, and as I have no darkey preacher to pray for me, I shall content myself with making a very brief apology for my absence. I will however, venture to tell you an anecdote which may have some remote relation to the subject under discussion. The late Simon Cameron, of Pennsylvania, a man of considerable wealth, as you know, visited the Bahamas several years ago, with the purpose of staying several weeks. He remained upon the Island just twenty-four hours. He recorded his reason for his sudden departure on the hotel register as follows: "I came to the Bahamas for change and rest. I find that the servants have got the *change*, and the landlord has got the *rest*." This is hardly true of Charlevoix, however, at the present time.

I would like to say before I take my seat, that the work that the Board of Health of Michigan is doing is worthy of the highest commendation. I have read some of its recent reports with a great deal of interest. They are among the best that are published in the country. They are full of useful information. They ought to have a very wide circulation. I trust that the work of this convention will be such that it will secure to the State Board of Health the interest and co-operation of the citizens of this county which the value of its work heretofore done ought to command.

HYGIENE OF SCHOOLS,

BY PROF. H. M. ENOS, CHARLEVOIX.

It should not be necessary, at this stage of the discussion of sanitary science, to cite any arguments to prove the importance of the public school as related to the means of promoting health. That this importance cannot be magnified out of its due proportions, is a fact already admitted

by all intelligent people who give any serious thought to the subject. A few simple considerations should be sufficient to awaken the keenest interest of every parent and teacher, and of every philanthropist, though he be neither of these.

The school is the populous center at which every portion of the community, and every home in it is directly or indirectly represented. Whatever promotes the physical welfare of the school is a public blessing; and whatever condition tends to a contrary effect, is a public calamity; and in these blessings and calamities every individual is a sharer. To this center, more than to any other, the germs of disease are likely to be carried, and from it to be scattered broadcast in families otherwise secure.

Again, in school, the enforced restraint of the natural activities of the child renders him peculiarly liable to the contraction of disease. Out of school, wherever he may be, in the open air, in the nursery, or ordinarily, pure air and plenty of it, the vigorous circulation induced by his native tendency to physical activity, and the exhilaration of youthful spirits, all furnish safeguards against the attacks of disease. In school these safeguards are to a great extent wanting; so that while the chances for exposure to disease are multiplied, the ability to resist it, is correspondingly lessened. If, in addition to this, we consider that ,whatever effects the health of the school unfavorably, poisons the fountain of life in the community almost at his source; that the evils springing from a neglect of wise sanitary measures in the school, are more far-reaching in their effects than those that grow out of like negligence elsewhere, we cannot be lacking for incentives to the utmost diligence in devising means for securing to it every possible healthful condition. The beneficence, great as it is, that endows medical schools and expends vast sums in experiments and investigations for the discovery of remedies for disease, is far outdone by that which seeks to train up a generation of men and women who have little need of those things because they are healthy, and know how to keep themselves so, having gained a practical knowledge of the laws of health, and acquired in early life the habits which conforms to them. There is reason to hope that the time is not far off when the established medical science will be that of prevention, rather than that of cure.

A proper appreciation of the force of arguments for vigorous sanitary measures in the school, requires us to entertain a correct idea of the true end of education. Until comparatively recent times, a majority of people seem to have looked upon education as a process of merely intellectual training, having only secondary reference to moral, and little or none to physical culture. The educated person was to have a *mind* certainly, a *heart* possibly, with the implied proviso that he *might* have a *body*, if the physical organism with which his education was begun could endure the strain to which the discipline of the school subjected it. Happily, all this is changing, and boards of education, parents, and teachers, are awakening to the truth that the preservation of health and the proper development of the child's physical nature is an indispensable condition of good mental and moral training, as well as a prime object to be sought in the process of education. So strongly has this sentiment taken root in the public mind, that the problem has become almost entirely one of the practical application of the best means to the desired end.

Unfortunately, there is often no little difficulty in applying a very simple and universally accepted theory; and this is true in the matter of physical culture. Teachers are too prone to emphasize mental training to

the neglect of the physical, and at the expense of health. There is a constant pressure from without upon our public schools, to aim at certain results in intellectual development; and teachers too often strive for those results at the risk of everything else. They are not to be blamed that this pressure exists, but they are culpable if they hazard the health of the children in yielding to it. The need of the times is that all who are responsible for the management of schools shall determine that good health and every condition of good health must be sought, first, last, and all the time, not as being of superior importance, compared with mental and moral development, but as absolutely necessary to these.

Accepting this idea of the true aim of education, and the proper function of the school, progress in the right direction requires that everybody shall recognize the essential conditions to the desired end, and presistently apply them. These conditions may be stated under three general heads: First, pure air. Second, proper physical exercise. And Third, those appointments of the school which appeal to, and cultivate the esthetic nature, and tend to promote a cheerful and happy temper. In this division of the subject it is not intended to ignore the laws of mental exercise as related to physical health; but if the requirements of physical exercise are fully met, there will seldom be any serious violations of the former.

Under the first head, attention is demanded to (1) the *location* of the school building, (2) its general construction, and (3) the special arrangements for lighting, heating and ventilating.

The time is doubtless past when any site is considered good enough for the the school house, except, possibly, in some semi-civilized localities, where it may still be found standing upon some isolated, uncultivable plot, surrounded by stagnant marshes, or swamps reeking with malarial exhalations, and chosen because it was cheap; and cheap because it was good for nothing else. The school site should be the most healthful locality in the district, and nothing should be tolerated about it which the most fastidious citizen would not allow in the neighborhood of his own dwelling. The nature of the soil upon which the building stands, deserves attention; it should be dry and porous, and if not so naturally, artificial drainage should be resorted to as a preventive of the evils that may otherwise result from pestilential vapors and dampness in the basement and walls of the building. It should not stand in a grove of timber, unless there is ample provision for the exposure of the building, during the greater portion of the day, to the direct rays of the sun, that every foot of ground upon which the children play shall be daily disinfected by light and air.

The rules to be observed in the general plan of construction, should have regard to the same requisites of wholesome air and sunlight. The basement should be as well ventilated as the school rooms, and the walls so constructed that extremes of outside temperature will not speedily affect that of the interior of the building.

Passing from the general features to be sought in the plan of the school building, we come to notice the special means for lighting, warming and ventilating it. Most of these requisites general and special, can be secured by the exercise of the most ordinary judgment and mechanical skill in planning, and a reasonable outlay in building. It is unfortunately the case, however, that in some communities, where even the private dwellings are of the best class, a false economy is practiced in public matters, which economy is pretty certain to reach its climax in the public school, where,

of all places, every detail should be planned with a view to the highest utility, regardless of expense.

Every school room should be large enough and high enough so that the floor space will not be less than twenty square feet, and the cubic measure not less than three hundred feet to each pupil. This estimate contemplates the use of the most effective means of ventilation, and no waste of room by stoves in heating. Light, in abundance, should be admitted at the rear and on one side, and thoroughly diffused, to guard against the evils of defective vision, too frequently traceable to the school.

The amount of floor space above suggested, contemplates single seats and desks for the pupils, and provides for their separation by commodious aisles. This arrangement has not only hygienic advantages, but moral and intellectual, as well, which will be clearly recognized without further comment.

The scope of this paper forbids entering into a discussion of any particular plan or system of heating and ventilating. Any school board or building committee can secure a vast fund of information upon that subject with no outlay, except that of the time spent in listening to the agents of any of the numerous patented systems now before the public. A few common-sense facts, based upon the unvarying laws of heat and air, must be kept in view in judging and applying any of these systems. There should be an abundance of pure air, warmed, if the season requires it, but never overheated, continually flowing into the room; and the means for drawing off the cold and impure air must be correspondingly ample. This requires that the exit flues be larger than those for the introduction of pure air, and that in some way, by artificial heating or otherwise a steady draught be maintained through them. For these purposes, no very complicated appliances are needed, provided the flues are of sufficient size, and their relative positions such as to insure the proper diffusion of the pure air before it is again drawn out. It is probably safe to assert that the fatal defect of a large portion of the heating and ventilating appliances that fail to give satisfaction, is, that they lack capacity, both for the warming and the introduction of pure air and for the removal of vitiated air. If, in heating the air, the stove or furnace is so small that the heating surface must be red hot in order to maintain the proper temperature of the room, there is danger that the air supply will be poisoned by carbonic oxide forced through the joints of the fire box or through the red hot iron itself. This gas is more to be dreaded than the carbonic acid exhaled from the lungs, and it is very likely to find its way into the current of air passing over furnaces that must be driven to their utmost to do the work required. With the fresh air loaded with this poison before it is introduced into the room, and the means of changing the air in the room so inadequate that it must be reinspired after becoming charged with the exhalations from the lungs, the wonder is that the results in many school rooms are not more immediately and apparently disastrous than they seem to be.

Heretofore, in the better class of school buildings, imposing architectural effects have been sought frequently at the expense of convenience and health. Thousands have been spend upon column, and cornice, and tower, while the health and lives of the children were sacrificed to a criminal parsimony in the matter of warming and ventilating. There has been a most hopeful awakening on this subject, and constant agitation gives promise of further progress in the right direction; but those rectangular boxes, otherwise called school rooms, which seem specially designed to gather

and hold the deadly products of overheated furnaces, and of respiration, while the unhappy victims are roasted on side and frozen on the other, have not entirely had their day.

If, in the construction of the school room, ample provision has not been made for its ventilation by the constant removal of vitiated air, the teacher must come to the rescue of the children by a vigilant watch over the condition of the room, and a frequent resort to ventilation by windows and doors. The utmost that can be done, in this way, in cold weather, will be wholly insufficient unless the capacity of rooms is far greater than that above suggested. This serves to emphasize very strongly the duty of the teacher in the management of the school, with reference to the means of preserving health. Very few schools have so perfect ventilating appliances that no care on the part of the teacher is necessary to insure the occupants against bad air. Teachers may be supposed to possess a fair share of common sense, but some of this common sense must be applied in looking after the physical welfare of the children, no matter how perfect may be the system of heating and ventilating employed. The matter of pure air is partly, and that of proper exercise (the second requisite to health preservation), almost entirely in his hands. In mild weather, when the outside temperature is not much lower than than that which should be maintained in the school room, doors and windows may safely be relied on to a great extent for the introduction and removal of air; but in cold weather, if other avenues of ample capacity are not provided, the teacher's skill and vigilance will be put to the severest test. It must be borne in mind that in a room fully up to the average capacity for an ordinary school, to leave the air for more than a half hour at a time, without a complete change, is to render every cubic foot of it wholly unfit for respiration; in fact, absolutely poisonous.

A moment's reflection will serve to show the magnitude of the demand for fresh air. A room 30x30 ft. and 14 feet high, seating forty pupils, should have its whole volume of air removed every twenty minutes. From such a room having eight ordinary windows and two outside doors, possibly one-fifth of the volume will be removed in favorable weather, through the joints of the window and door frames. Four-fifths must still be removed by special means, and for this purpose an exit flue not less than 12x16 inches will be required, estimating the rate of movement through the flue to be four miles an hour. This may be considered a very slow rate of movement, but there will be times when even properly arranged flues will not remove the air at a more rapid rate, and that, too, when the need of frequent change is greatest. This calculation supposes, of course, that means exist for the introduction of an abundance of pure air through independent flues.

What shall the teacher do in the face of these demands, when no special means of ventilation are provided? There can be no remedy but to give the children frequent recesses, either indoors or out, and to open doors and windows at the same time, so as to flush the room with pure air. It is impracticable in most schools to give as frequent recesses out of doors, as the supposed case demands. Resort to open doors and windows must still be had, and vigorous physical exercise taken meanwhile, to prevent taking cold by contact with the the colder air. This occupies time, and teachers too often neglect such measures because the demands of routine work seem to be imperative. But it must be remembered that mental effort in a vitiated atmosphere accomplishes but little, and the loss of vitality from

work under such conditions is almost beyond remedy. The teacher should be urged to secure the needed relief no matter what the loss of time may be. Better make but three months' progress in a year, and preserve health, than to sacrifice it in an attempt to accomplish more. It is needless to say that the attempt to carry on a school in a room ventilated only in the wasteful manner just indicated, is the most expensive and inexcusable folly that the authorities of a district can be guilty of. It must not be supposed, however, that, if the school room is ventilated sufficiently by special appliances, the physical exercise of the pupils, already referred to, can be safely neglected. In any school of the younger class of pupils, the ordinary intervals of out door recesses should be broken for important reasons other than the air supply. Vigorous muscular exercise should be made a regular practice, no matter how abundant the supply of pure air. After a few minutes of quiet at his desk, the breathing of the child becomes shallow and insufficient to supply the blood with oxygen and remove the wastes that seek an exit from the sytem through the lungs. The circulation of the blood is correspondingly slower, and the two act mutually to increase the need for some artificial means to promote healthy action. Contracted chests, improper habits of breathing, and weak circulatory organs must certainly result from a disregard of this demand.

Still another pressing reason for frequent physical exercise is that the bones of children are soft and flexible, and easily yield to the unnatural positions which they are constantly prone to take when the normal activity of the body is restrained. The improper position of windows, the ill-adjustment of the height and spacing of seats and desks, all tend to aggravate the causes that produce malformation of the bones. Experience has shown that hardly any possible position is injurious to a child, provided he is not compelled to retain it too long, or assume it too frequently; and equally true is it that almost any position which a child will naturally assume when engaged in study, may assist in producing some deformity of the bones, or weakening of the respiratory or circulatory organs, unless relieved by the frequent application of artificial means. As often as every half hour, in primary schools, some systematic exercise should be taken which will call into play the muscles that have been inactive, give every bone in the body a chance to throw off the tendency to assume an abnormal shape or condition, expel the air from the lungs, quicken the respiration, and send the blood with accelerated pulses through the system. The temporary relief from, or change of mental labor at these periods will also assist in preparing the child for a more satisfactory prosecution of his studies.

The tendency on the part of teachers to fall into the habit of neglecting these precautions, has already been mentioned. The general management of the school, which falls jointly upon the teacher, the school board and the public at large, must provide for the proper discharge of this important function of the teacher. If overcrowding the course of study, or the implied demands as to the rate of progress to be made by the pupils, is in any way responsible for such neglect, then a revolution in the interests of common humanity is needed in the community.

But that school management which confines its aims to the preservation of health, simply, however well it may do thus much, still falls short of its true purpose. Not only to keep children well and guard against contracting disease, is the teacher's duty, but to inculcate *habits* conducive to the preservation of health, and which shall stick to them for life. As far as

possible, these habits should be made to regulate the positions they assume in sitting and standing; the exercise they take; the manner in which they breathe. They should be taught to appreciate the value of good health, and the duty of preserving it. They should know the simple laws of health as relating to *food*, *air* and *exercise*. They should be taught first of all, perhaps, to consider air, vitiated by the products of respiration, as the most loathsome, as well as the most baneful element that can ordinarily be encountered; and to shrink from it as they would from a pestilence clothed in its most repulsive forms. These attainments do not require any elaborate system of text book instruction; they may to a great extent become matters of habit, resulting from simple, practical measures, judiciously carried out by the ordinary teacher. It is not to be expected that in this department of effort, perfect results can be attained. Not every child can be trained by the teacher alone, to sit, stand, and walk erect, and to avoid all causes detrimental to health; but the amount of good that can be accomplished by wise and persistent effort is incalculable; and there is further cause for encouragement in the thought that maxims impressed upon the minds of youth, if not immediately applied by them in their course of conduct, will often bear fruit in maturer years.

The third requisite to the highest hygienic condition in the school includes those appointments that tend to cultivate the higher tastes of the children, and to promote a cheerful temper. If the yard is a dreary, repulsive waste; if the building is neglected and uninviting without, and dingy and prison-like within, it cannot fail to produce mental effects inconsistent with perfect physical health. Very few people rightly appreciate the rank which this condition holds among the requisites of a healthy school. When we reflect what a powerful influence is exerted upon the mind by pleasant or unpleasant surroundings, and couple with this a thought of how much the cheerful temperament which usually characterizes the child, has to do with the perfect health which he enjoys when hygienic laws are not too flagrantly violated, we shall, I think, be ready to admit that here is a field for the philanthropist, and one which the teacher and school board cannot neglect without serious loss. It is true that the interior management of the school has perhaps more to do in this direction than any other cause, but with that or without it, much can be done to make the school a place where childish natures will better thrive than in the dreary places, not infrequently found dignified by the name of school, and in which, aside from the sunshine which the teacher can throw into them, have nothing to attract the child or influence him for good. Every thing about the school,—its architecture, its furniture, the care of the school room, the building and its surroundings, should be elevating in its influence; it should tend to cultivate good tastes, a love for the beautiful, and habits of order and cleanliness. It needs not to be proven by arguments, that whatever training leads in this direction will develop and strengthen habits of thought and action in accord with the laws of both physical and moral nature.

In the particular of cleanliness, it is a matter of public duty that provision be made for keeping the building, the yard and outbuildings free from all that is unwholesome or offensive to a refined sensibility. While these principles are generally accepted, it is, nevertheless, an unwelcome fact that in some schools the condition of the rooms themselves, and particularly of the yards and outbuildings, is a disgrace to civilization, and such as no decent people will tolerate about their houses. While such

criticism may not often apply at the present time, there are yet many places where it is not wholly out of place.

The responsibility for these defects lies primarily with the authorities of the district; but in the discharge of that responsibility, the teacher must really bear an important part. The oversight of the personal cleanliness, particularly of the pupils, if neglected at home, as it often is, must devolve upon the teacher. A wash basin, a cake of soap and a towel ought to be regarded as necessary supplies of a school. Some children will scarcely have an opportunity to learn the use of them unless they do so at school; and even the most tidy children will frequently feel the need of these conveniences, the lack of which may tend to a degree to make them careless of personal neatness. By judicious measures in these particulars, children should be taught that dirty faces and hands, and all uncleanly personal habits are offenses against good breeding, and not to be tolerated.

No very radical means are required to work great reforms where needed. The teacher who works judiciously by encouraging the better elements, and skillfully prompting the careless ones will frequently accomplish most. But if indirect and mild means fail, shall the teacher resort to radical ones to secure the desired end? Shall pupils who cannot be induced to conform to the requirements of personal cleanliness, be excluded from school? To this last as a question of public health, as well as one of public taste and morals, there can be but one answer. Public sentiment must sustain such a course unless blind to the best interests of the community; and the time is not far distant when it will demand it.

Closely related to this is the question of excluding temporarily from the school, pupils who have been exposed to infectious or contagious diseases, or in whose families such diseases exist. Too great vigilance cannot be exercised in this particular. The most perfect isolation of all such cases, is the sheet anchor of boards of health, and the foremost means by which the ravages of such diseases are to be reduced to a minimum. The greatest difficulty is always experienced in those cases where the disease has not advanced sufficiently to remove all doubt as to its true nature. Parents often desire to keep children in school, believing that no danger exists. In such instances, the benefit of the doubt should be given to the public, and the natural anxiety which parents of other children feel, should be removed by the prompt exclusion of those who may possibly bring contagion.

The safeguards employed against the spread of diseases in this way are still far less effective than they might be; and in this field there is still a great work to be done.

The investigations prosecuted by the State Board of Health, and the measures set on foot by it, have produced most highly gratifying results. Not the least of the benefits flowing from it is the creation of a growing, healthy, public sentiment regarding the importance of effective local coöperation with it in these humane endeavors.

DISCUSSION OF THE SUBJECT OF SCHOOL HYGIENE.

By Prof. David Howell, Principal of the College of Liberal Arts, Bay View Summer University:—

I believe that nothing was said by the author of the paper about the present school stairs and the effect upon the children. One of the most frequent complaints made to me is that the children have to climb too many

stairs. I have nothing to say in favor of two and three story school buildings, but I also notice that there is no particular attention given to instruction in how to climb stairs properly. I often notice people walk along the street at a moderate walk, but when they come to a flight of stairs they run up them two or three at a time. I have seen parents climb steps that way. I mention this so that you can lay the blame where it belongs. The children imitate, and thus the same tendency to climb steps improperly appears in the school house that is displayed on the street. There is a proper way to climb stairs and an improper way. Don't place your toe just on the edge of the step, but place your whole foot on the step and walk up the steps moderately. In climbing the stairs in the first way, you strain the muscles of the whole body.

The children are not warmly clothed. I say it is a shame to send them to school so scantily clothed. I have seen girls stand shivering in the cold, waiting for school to call. If one of those girls should get sick the parents would lay it to the school. Are the schools responsible for this? The parents must take some of the responsility and blame as well as the public school.

Another point. Many parents say their children's eyes were injured in school, when in fact the eyes were injured before they went to school at all. I suppose there are some cases of defective eyesight that can be properly charged to the public school. I believe the baby-cab is more injurious to the eyes than the school. I saw a baby lying in a baby-cab on the street the other day, and the sunshine was pouring right down into its eyes. This causes great injury to the eye. In examining children's eyes you will find that many of them have defective eyesight. I think every school board should have among its members a good physician to examine the children's eyes. The children's eyes should be carefully tested before going to school. Much has been said against blackboards in school. I think the blackboard is better than paper. It is injurious for a child to write long upon paper. Glazed paper should not be used. It is a great advancement toward the protection of the eye to have proper ventilation.

Another question of importance is the recess in many of our schools. I stand here to-day as an advocate of in-door recess. I do not believe that a child should be given from 15 to 20 minutes recess out of doors. I do not think it is conducive to health. I think better methods can be produced. I would not do away with the recess entirely, I would have gymnastics. I would have the children march about the room. I would not have them exposed to the inclemency of every kind of weather as I have known them to be a great many times under the recess plan. I have had ten years experience of the no recess plan, and about the same length of time under the recess plan; and I say that neither the teachers, parents, nor pupils would go back to the old plan. My objection to the recess plan is chiefly the immoral things that are done during these recesses.

Every family should have a physician to examine the children's eyes. I have mentioned this to some families and they would say "if we need a physician, we will call him." Not only the schools but the parents also are responsible for their children's health.

If I have said anything that will cause you to look into your schools, I will consider that I have not stood here in vain.

By PROF. V. C. VAUGHAN, M. D., Member of the State Board of Health, Ann Arbor, Mich.:—

I was very much interested in the paper that Prof. Enos read, but there are one or two things that I should like to emphasize. I think we have a right to feel proud of Michigan so far as its public schools are concerned. It is generally admitted that the public school system of Michigan is the best in the Union. The people of the State of Michigan have spent considerable money upon the public schools; this is general everywhere. There is scarcely a village in the State in which you do not find that the most prominent and best building is the school house; yet there are some criticisms that I should like to make.

In the first place the school term is too long. The teachers work too hard. The school term begins the first week in September and in many schools the last week in August, and continues until the last week in June. Ten months, omitting the short vacations at Christmas and Easter, our little children from 5 years upwards are expected to work. Careful statistics have shown that the average child grows more in the two months vacation than he does in the ten months of school work. I read a report from Sweden where these measurements were made on 10,000 children. I say the school term is too long, far too long. Why is it so long? There must be some reason. It arises from the desire of the school boards to get all the work out of the teachers they can. I dare say that the teachers would do better and our children grow stronger if our school term was cut down at least one month.

Secondly, too many parents want to get rid of their children, get them out of the way, send them to school. What better than to send them to school? I think this is wrong. Our children would be better off, they would do better work, and if our teachers, now underpaid, get the same money they would do better work if the school term was shortened at least one month. The average temperature in September is higher than it is in June. In many instances we have higher temperature in September than in July. It is wrong, to ask little children to go to school in that month.

Another criticism: a great deal of money has been spent in building school houses. We have good schools, yet it has not been spent as intelligently as it should have been. In nearly every village we find a prominent place selected for the building. A great deal of money has been spent on outside decoration and not enough has been spent in securing proper ventilation. I think this is not due to any niggardliness, but to a false conception of the importance of this subject. School boards are not competent to judge of these matters; they leave it to the architects. Architects as a rule have no knowledge whatever of sanitary matters. They are paid to decorate the houses, to make a show outside. It does not pay them to give a great deal of attention to ventilation and hygiene. Another thing: in a great many instances too little space is given to the play ground. Prof. Enos has said that every pupil needs twenty square feet in the school room. I say that in the play ground sixty square feet are needed. It is not that the child should get out when the weather permits but that they should have enough ground to play in when they do get out. I was very much pleased to see that Prof. Enos did not claim long hours of study. I do not believe that the course of study is too rigorous. I do not believe that children are often injured by over study. They may be injured by being kept in school too long, but not by over study. Several years ago I had occasion to look up the names of prominent men in liter-

ature. I collected five hundred names of men of intellectual activity and I looked up their lives to find out how many years they had lived and what do you suppose I found? The average life of these men was seventy-eight years. Longer than the average life of a farmer or doctor. This goes to show that intellectual activity does not shorten life. The man who exercises his brain as well as his body is likely to live longer than the man who allows it to remain dormant. The increased near sightedness in our schools is not due to over study, but it is due to improper sanitary conditions. The student would grow faster if he studied under pure hygienic conditions.

DR. J. H. KELLOGG, Member of the State Board of Health, Battle Creek, Mich.:—

It is an omen of good for the country that this subject is receiving so much attention. If we go back in the history of the race we find that the subject of properly taking care of the body was not considered at all. There were three thousand years in which no man or woman in all Europe took a bath. I was talking to a young lady not long ago about exercising her muscle and making herself strong. "O, no; the ladies of my set would say that I was too masculine if I was strong and vigorous." This idea seems to be in a great deal of our Sunday School literature. If a woman is spiritually good she is always sickly; if boys or girls are especially good, they are hunch backed. Vigorous health is conducive to good morals. If you want a boy to have good morals the way to begin is to train his muscles. It seems to me that the training of the muscles of the boys and girls is one of the most important things that can be considered in this convention. If a child's muscles are quite thoroughly trained up to the age of sixteen or eighteen years, he is laying in a stock of health that will last him a lifetime. It will be found of more value to him than if his father had left him half a million dollars. * * *

To supply an ordinary house with fresh air an opening 6½x12 inches is required for a family, say, of six persons. Suppose you have a public school of sixty pupils. Don't you need just ten times as much for sixty persons as you do for six? If we do not have proper ventilation of our school houses some of the children will be taken with scarlet fever or some other disease, then another and another, until the school house becomes a hot-bed of disease. We must have proper ventilation in our buildings, a place for the foul air to go out and a place for the fresh air to come in. The orifice for the fresh air to come in should be about the same size as that for the impure air to get out.

Every teacher should make a thorough study of the pupils that come under his or her care. There should be a regular physician to examine the pupils from time to time. Many pupils form the foundation for life-long illness in the school room. I, too, have yet to see the instance where a pupil was injured by over study. The brain takes care of itself. It is very easily rested. It receives one-fifth of the food supply of the body. Even when the brain is completely tired out listening to a piece of music a slight rest will restore it. I say if you can keep the rest of the body in the proper condition the brain will take care of itself. Although the child in school is subjected to many bad conditions, yet the child does a great deal of brain work outside of the school. A great many children sit up at night reading worthless novels and trashy papers. Reading books like these, that we often find in the pockets of pupils is more

dangerous to them than all the studying that they do while in school. The child who sits up half the night to finish an exciting novel has hard work the next morning to focus his attention on his studies. I think if we have proper exercise there will be no complaint of over work in the school room. I think that a child should be subjected to a systematic course of training from the time he rises in the morning until he goes to bed. Of course he should have a chance to let the natural exuberance of spirits escape, but he ought to have something to occupy himself all the time. It seems to me that we do not have too much school. I am not in favor of having the school term shortened. If it is bad to have the child's growth stunted for ten months, it is bad for nine months, or even a single week. I am in favor of having the children exercised during the school term. The reason why the children's brains become tired is because they are working under disadvantageous circumstances.

I made a trip to Sweden to look into the methods of exercising pupils while in school. It is found that children are in better health and study better by having a system of exercise in the school room by a course of gymnastics,—bending forward, moving their arms, marching around the room. Here the pupil is kept steadily at work for two or three hours under disadvantageous circumstances and his brain becomes poisoned, so that his memory is not tenacious enough to carry the results of his study much more than until the next day. When a child enters the school a teacher should find out whether the child is far sighted or near sighted. If means are not taken to remedy this fault it will continue to get worse as he advances in his studies. You would be surprised to find out how many of our students in the higher schools are compelled to wear glasses from this cause. The teacher should find out whether a pupil is color blind The teacher should look into the pupils' throats to see if they have any symptoms of sore throat. The teacher should know something about contagious diseases. Dr. Hazlewood will tell you about them. The teachers should be made to look after these matters as a whole school has been known to be afflicted with sore eyes because of one pupil that brought it into the school. Sore eyes are not contagious unless there is water running from them. The methods that Prof. Enos proposed, for the pupils to cleanse themselves, is a very good one but I would suggest that every pupil have a towel of his own. I believe when we can have the ideal system of education, alternate exercise and study, that we will be able to have school 365 days in the year without injury to the pupils, who will grow up to ideal manhood and womanhood.

SECOND SESSION, THURSDAY, AUGUST 14, AT 8 P. M.

Rev. W. H. McCartney gave an address on "The Present and Future Water-supply of Charlevoix," and illustrated his address by a large diagramatic map,—the address was not in manuscript form and is not here re-produced.

Victor C. Vaughan, M. D., member of the State Board of Health, Ann Arbor, Mich., discussed the subject "The present and Future Water-supply of Charlevoix." There was no report of this discussion and it is not here re-produced.

THIRD SESSION, FRIDAY, AUGUST 15, AT 9:30 A. M.

THE RESTRICTION AND PREVENTION OF DANGEROUS DISEASES.

BY HENRY B. BAKER, M. D.

Mr. President, Ladies and Gentlemen:

One of the first questions suggested by the subject assigned to me is, "What diseases can be restricted or prevented?" So far as relates to the class of diseases the answer is easy, the diseases which can be restricted are those which are *communicable.* The "communicable" diseases include those which are contagious, those which are infectious, those which in any way are communicated or spread from one person to another, such diseases as small-pox, scarlet fever, diphtheria, measles, and whooping-cough.

Then an important question is—whether any of the most dangerous diseases which have not heretofore been considered communicable do really belong to that class, and can therefore be restricted or prevented. To this question we can now answer yes. At least one of the most dangerous of all diseases, namely consumption, has, in recent years, been found to be a communicable disease, and a preventable disease.

There is considerable evidence now tending to prove that pneumonia is a communicable disease, and that probably many deaths from that disease could be prevented by the general adoption of measures which recent investigations have revealed.

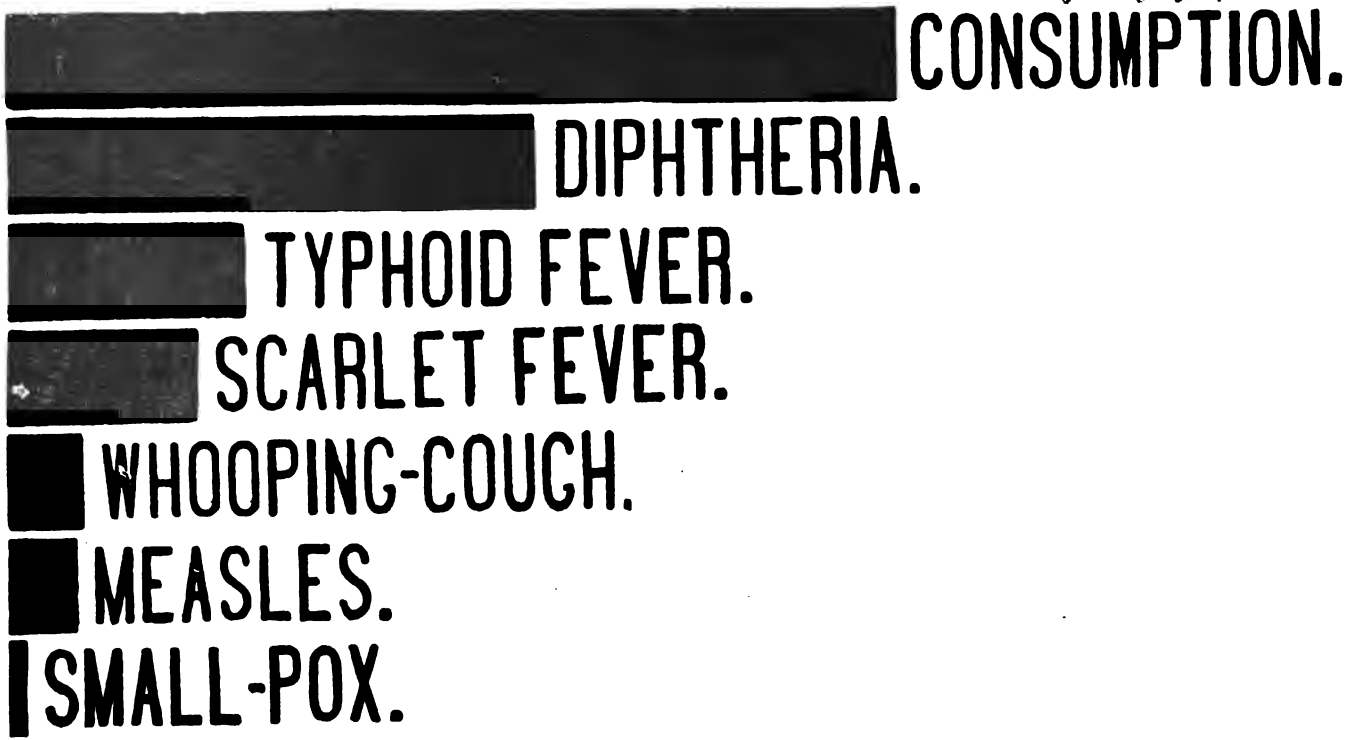
THE IMPORTANCE OF THIS SUBJECT.

The importance of the subject of the restriction of the dangerous diseases cannot easily be estimated. Let us see what aid the vital statistics can give us. The statistics of deaths in Michigan are not perfect, but the relative importance of the several diseases is probably shown with approximate accuracy. The diagram which I exhibit,* ("Deaths in Michigan, 1876-'87,") and copies of which are distributed in this audience, is accurately drawn to scale and correctly represents the deaths reported to the Secretary of State. This diagram shows the relative importance of the several dangerous communicable diseases. It shows that in Michigan every one of the diseases named in the diagram is much more important than small-pox, as a cause of deaths, and that when compared with diphtheria and especially when compared with consumption, small-pox is insignificant, or at least that it was so during the twelve years 1876-87. If the diagram included pneumonia that disease would appear between "diphtheria" and "typhoid fever," and then the five diseases which cause most deaths in Michigan would be shown in the diagram. The five diseases which cause most deaths in Michigan, named in the order of their importance, are: Consumption, diphtheria, pneumonia, typhoid fever and scarlet fever.

We thus gain some idea of the vast importance of this subject, the restriction and prevention of the dangerous communicable diseases, which include all the most important causes of deaths in Michigan. Especially do we appreciate the importance of this subject when we consider that we absolutely know that a large proportion of the cases and deaths from the most of these diseases are *preventable,* and I believe that this is true of all of these diseases.

* The Diagram is printed on page [illegible].

DEATHS IN MICHIGAN, 1876-'87.



This diagram is accurately drawn to a scale, and the *relative importance* of each disease, as a cause of deaths in Michigan, is, therefore, correctly shown. All the diseases mentioned above are believed to be caused by micro-organisms, some of which have been discovered.

COÖPERATION NECESSARY FOR THE RESTRICTION OF DISEASES.

For their prevention, however, it is necessary that all the people shall coöperate. No one can fully protect himself so long as others do not understand the subject and act accordingly. Therefore, the only way these most important causes of death can be most completely avoided by any of us, is by increasing the proportion of the people who know how to restrict and prevent them. If we except small-pox, which may, by vaccination, be avoided by each person for himself, this statement is true relative to each of the dangerous communicable diseases. For the restriction of each there is required general diffusion of knowledge, and general coöperation of all classes of people. That is a good reason why "the restriction and prevention of the dangerous diseases" is given so prominent a place on the program of every Sanitary Convention.

HOW THESE DISEASES ARE SPREAD.

But these diseases are not all spread in the same way; and it is necessary that the people generally shall know how each one is spread, in order to know how to restrict each disease. In each disease, something goes from a sick person which is capable of causing the disease. It goes from that part of the body in which the disease is located, and generally it thrives best when it reaches that same part, of the body to which it goes. In consumption that part is generally the lungs; and the specific cause of consumption goes out with the sputa, and is scattered about not only wherever the moist sputa goes, but also wherever the dust from the dried sputa goes. And, as the dust of the air is breathed in with the air inhaled, there is opportunity for the specific cause of consumption to go at once to the part of the body in which it is usually found.

This indicates what is the most important measure for the restriction of consumption,—namely, the *destruction or disinfection of all sputa from every consumptive person.*

But this subject is to be sufficiently dealt with by the speakers who are to follow me.

TYPHOID FEVER.

Typhoid fever causes about ten times as many deaths in Michigan as small-pox does; probably about one thousand deaths per year; and most of these deaths should be prevented. The greater number of deaths from typhoid fever is of persons in the prime of life, and this should prompt to greater efforts for the prevention of this disease.

TYPHOID FEVER and SEWERS.
AV. 313 CITIES WITHOUT.
AVERAGE, 39 CITIES WITH,
MUNICH.
1854-59, NEGL'CT,
1860-65, CEMENT VAULTS.
1866-73, PART S'W'RS.
1874-80, SEWERS CON'TD
1881-84, SEWERS CONTINUED.

The most common modes of spread of typhoid fever are not the same as of small-pox, and consumption, consequently the measures for its restriction and prevention are not the same. The pamphlets on this subject issued by the State Board of Health, and freely distributed here, contain plain directions how to prevent typhoid fever, and how to restrict its spread. It is now believed that typhoid fever is most frequently spread by means of the drinking water, that the microscopic cause of the disease is probably reproduced in the bodies of persons who have the disease, and that this specific cause gains access to the drinking water by filtering through the soil, and sometimes by being washed into wells or streams from which the drinking water is drawn. The noted instance at Lausanne, Switzerland, where the discharges from typhoid fever patients were thrown into a small stream, which disappeared by sinking into the earth and gravel, and re-appeared about a half mile distant as a mountain spring, the clear water of which caused typhoid fever in 144 persons, is instructive, and is useful for us to hold in mind as illustrative of how the disease may be spread. The most usual mode of spread is probably by way of the privy vault and the neighboring well. The facts concerning the outbreak at Lausanne prove (and the same has been indicated in other instances) that the cause of typhoid fever sometimes passes great distances by way of the underground water flowing through strata of gravel. We must not forget, however, that typhoid fever may be spread through the air, that the supposed "germ" of the disease is not destroyed by once freezing, and is not yet known to be destroyed by ordinary drying. We know that the microscopic "germ" of consumption is most dangerous when dried and floating in the air we breathe. It may be that the specific cause of typhoid fever is dangerous in the same way.

The prevention and restriction of typhoid fever requires the disinfection of all bowel discharges from those sick with such disease, and constant watchfulness of the sources of supply of water for drinking and culinary purposes. All water from a suspected course should be boiled before its use. Numerous instances are reported where typhoid fever has been spread by the rinsing of milk cans with water apparently pure, but really infected with the germs of typhoid fever, capable of infecting the milk. This teaches us the importance of having water free from typhoid infection for all household purposes.

Typhoid fever is a disease which, in my opinion, it is important that citizens of Charlevoix should understand, because of the nature of the soil and earth underlying this place and the surrounding country from which your milk supply comes. Sooner or later there will come a time when no ordinary well in such a place as this can be safely relied upon to supply water free from the cause of typhoid fever.

But the general water supply of cities and villages is a matter of the greatest concern, and it should be procured from places where there can be no probability of immediate or remote contamination. The well-known out-break of typhoid fever at Plymouth, Pa., where over a thousand cases and 114 deaths occurred, is apparently an illustration of how great a calamity may follow the fouling of a general water-supply by the specific cause of typhoid fever.

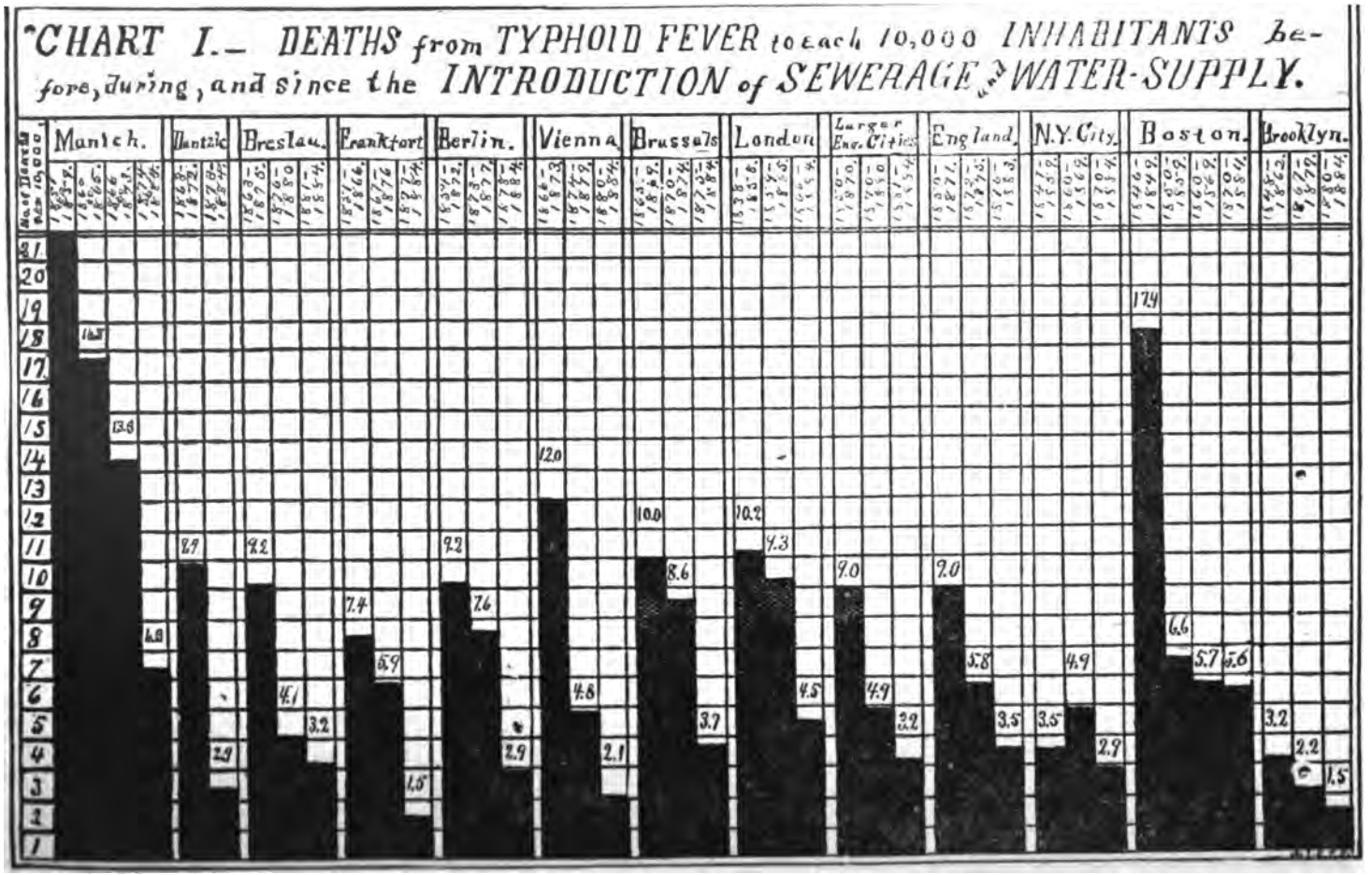


CHART I.— DEATHS from TYPHOID FEVER to each 10,000 INHABITANTS before, during, and since the INTRODUCTION of SEWERAGE and WATER-SUPPLY.
Manch.
Dantzic
Breslau.
Frankfort
Berlin.
Vienna
Brussels
London
Larger Eng. Cities
England
N.Y. City.
Boston.
Brooklyn.
Annual Deaths per 10,000.
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
13.5
13.6
6.8
12.9
2.9
12.2
4.1
3.2
7.4
5.9
1.5
12.2
7.6
2.9
12.0
4.6
2.1
10.0
8.6
3.7
10.2
7.3
4.5
9.0
4.9
2.2
12.0
5.8
3.5
4.9
3.5
2.9
17.4
6.6
5.7
5.6
3.2
2.2
1.5

CHART II. — DEATHS from TYPHOID FEVER to each 10,000 INHABITANTS in SEWERED & UN-SEWERED CITIES. Av. of 5 yrs., 1880-84, - unless otherwise stated.
A. Cities with good sewers and a general water-supply.
B. Cities without sewers, or very imperfectly sewered.
No. of Deaths per 10,000.
Munich.
Dantzic.
Frankfort.
Breslau.
Hamburg.
Berlin.
Brussels.
London.
25 large Eng. Cities
New York.
Brooklyn.
Vienna.
Paris.
Marseilles.
Turin.
Naples 1881-84.
Paterno 1881-84.
Catania.
231 Cities in Italy.
St. Petersburg 1883-84.
Riga 1881-82.
Budapest 1877-81.
29 German Cities 1878-82
New Orleans.
Baltimore.
Cincinnati.
Average of the 10 cities 1875-85, 3.0
Average 2.4
1880-82
1881-82
Lime.
Average
Average supply from artesian wells.
Average supply from deep wells.

There is not time at my disposal to give all the evidence proving the enormous saving of human life from the ravages of typhoid fever which in recent years has been accomplished because of such knowledge as this to which I have just alluded; but I wish briefly to refer to some of this evidence. In a pamphlet published by the Michigan State Board of Health, and entitled "The Influence of Sewerage and Water-Supply on the Death-rate in Cities." Mr. Erwin F. Smith, shows conclusively very great reductions in the mortality from typhoid fever in many of the great cities in this country and in foreign countries, the reductions in the typhoid mortality following the introduction of systems of sewerage and general water-supplies. For instance, in the city of Munich the death-rate from typhoid fever in the period from 1854 to 1859 was 24.2 per ten thousand inhabitants, while in 1884 it had declined to 1.4 per ten thousand inhabitants; that is, before the city was sewered, and while it was supplied with water from wells, the mortality from typhoid fever was about seventeen times as great as it was after the city was well sewered and had a good general water-supply. (This is shown in the Diagram on page 20.)

To give you a mental image of this important subject, I have had copies made of two diagrams prepared by Mr. Erwin F. Smith to illustrate his paper, and they are here for distribution to such of you as will study them.*

If there should be in Michigan such a reduction of the mortality from typhoid fever as was secured in Munich through better sewerage and water-supply, there would be a saving of over nine hundred lives per year, and over nine thousand cases of sickness per year. To point out how such favorable conditions for healthful existence may be secured, is one of the objects of such sanitary conventions as this.

Let us pass now to the consideration of diseases which are fatal chiefly to children.

Diphtheria.

About eighty-five per cent of all the deaths from diphtheria are of children under ten years of age. Grown people have diphtheria, but it is usually considered as only an ordinary sore throat, and proper precautions to prevent the spread of the disease are not taken. This ought to be generally known, and many more lives can be saved when all our people come to understand the facts.

In Michigan diphtheria causes about seventeen times as many deaths as small-pox does. I think that it is probably more contagious than small-pox; because the spread of diphtheria is not usually so easy to trace, and yet we know that diphtheria is contagious, because it is sometimes very easy to prove this, and to trace its mode of spread. Diphtheria seems to be more frequently spread by indirect means than small-pox is; because if it were not, we ought to be able to trace the spread of diphtheria as easily as we do the spread of small-pox. But whether diphtheria is more or less contagious than small-pox, one important reason why we suffer so very much more mortality from diphtheria than small-pox is the fact that for diphtheria we have no such preventive measure as vaccination.

Diphtheria is prevented by keeping away from where the disease is, and from everybody and everything that has been near the disease, keeping away until everything has been disinfected. In order that this shall be possible it is essential that every place where diphtheria is shall be promptly reported to the health officers and plainly placarded. The law requires the local board of health to "give public notice of infected places," and to "use

* These Diagrams, Chart I. and Chart II., are printed on pages 22 and 23.

all possible care to prevent the spreading of the infection." Another law requires the health officer to "give public notice of infected places by placard on the premises, and otherwise if necessary." Common humanity requires of every person that he do his utmost to fulfill the letter and spirit of all such laws for the public safety against such a terrible disease as diphtheria.

The law was amended at the last session of the legislature, and its provisions should be generally known. Every householder, hotel keeper, keeper of a boarding house, or a tenant is required to report, to the local health authorities, diphtheria and any other disease dangerous to the public health, and whoever fails to do this is liable to a fine and to imprisonment if the fine is not paid. Physicians are required to report, and if the physician reports the householder is excused from that duty. Health officers, unless otherwise ordered by the local board of health, must take prompt, thorough, and efficient measures to stamp out the disease;and if they neglect their specified duties they are liable to a fine and to imprisonment if the fine is not paid.

But however good the laws may be, their execution depends upon the enlightened public sentiment of the locality, upon the people themselves, from whom the prompt notice should go to the local health officer, and upon intelligent and faithful local officers who should perform duties which are of the highest importance to the people.

Scarlet Fever.

Scarlet fever is a a disease to be dreaded on account of the mortality which it causes and also on account of the permanent injuries which result from it. Thus, as an instance, of 263 pupils in the Michigan State School for the Deaf, at Flint, during the years 1887–8, who became deaf since their births, the loss of hearing of 16 per cent, is attributed to scarlet fever.*

Of the 114 pupils in the Michigan State School for the Blind, at Lansing, during the two years 1887–8, who became blind since birth, 6.1 per cent lost their sight from the effects of scarlet fever.†

In Michigan scarlet fever causes about nine times as many deaths as small-pox does. The only *preventive* is to keep away from the disease, and to allow no person or article infected with the scarlet fever contagium to come near a person susceptible to that disease.

For its restriction, except that there is no vaccination, all the measures proper in the case of small-pox are proper in scarlet fever.

Inasmuch as scarlet fever causes nine times as many deaths as small-pox does, the importance of prompt notice to the health officer is at least nine times as great as it is in small-pox.

All the other measures should be promptly and thoroughly executed. I will not stop to give you details. They are published in our pamphlets here for distribution.

Practical Results in Restricting Scarlet Fever.

At the close of the year 1887, the statistics as published by the State Department, showed that the mortality from scarlet fever in Michigan had been reduced in the years when the measures recommended by the State Board of Health had been to some extent fulfilled, so that over five thou-

* 18th Biennial Report of the Board of Trustees of the Michigan School for the Deaf.
† Report of the Superindent of Public Instruction, Mich., 1888, pages, 78–80.

sand six hundred persons had lived who under the old mortality rate, before the Board began its work, would have prematurely died. This is an average saving of four hundred lives per year—rather more than a life every day for fourteen years—saved from that dread disease, scarlet fever.

But we have other evidence than the mortality statistics, showing the great saving of life which it is possible to have in Michigan through such measures for the restriction of scarlet fever as I have briefly outlined. The experience of the local health officers in restricting scarlet fever in this State is reported each year to the State Board of Health; and a compilation of these reports shows that in those outbreaks in which isolation and disinfection were neglected there were about five times as many cases and about five times as many deaths as in those outbreaks in which they were enforced.*

This is about equivalent to saying that four-fifths of the cases and deaths from scarlet fever are known to be preventable through measures which we can describe in three words—*isolation and disinfection.*

PRACTICAL RESULTS IN RESTRICTING DIPHTHERIA.

While on the subject of the saving of life in Michigan, I may mention that the experience of the health officers in restricting diphtheria in this State is also reported each year to the State Board of Health, and a compilation of these reports shows that 833 lives were saved and 4,374 cases of sickness prevented from diphtheria in Michigan during the year 1886, and that in the year 1887, 518 lives were saved and 2,371 cases of sickness prevented; during 1888, 416 lives were saved and 3,292 cases prevented. Thus during the three years 1886, 7 and 8, over ten thousand (10,037) cases of sickness were prevented, and more than seventeen hundred (1,767) lives were saved from diphtheria in Michigan. Or, another way of stating this is to say that during the last three years the *known* saving of life in Michigan from diphtheria has averaged one and a half persons per day.†

PRACTICAL RESULTS IN RESTRICTING SMALL-POX.

The statistics collected and published by the Secretary of State of Michigan, taken in connection with the facts on record in the office of the State Board of Health, prove that in Michigan, through such measures as I have outlined, the mortality from small-pox has been reduced, and that if it had continued at the same rate as before the State Board of Health was established, more than one thousand five hundred persons in Michigan *would* have died from small-pox that have *not* died of that disease.* This was true at the end of the year 1887, and since that time the mortality from small-pox in Michigan has not increased. The statistics now cover so many years that we think there can be no doubt of the reliability of their evidence.

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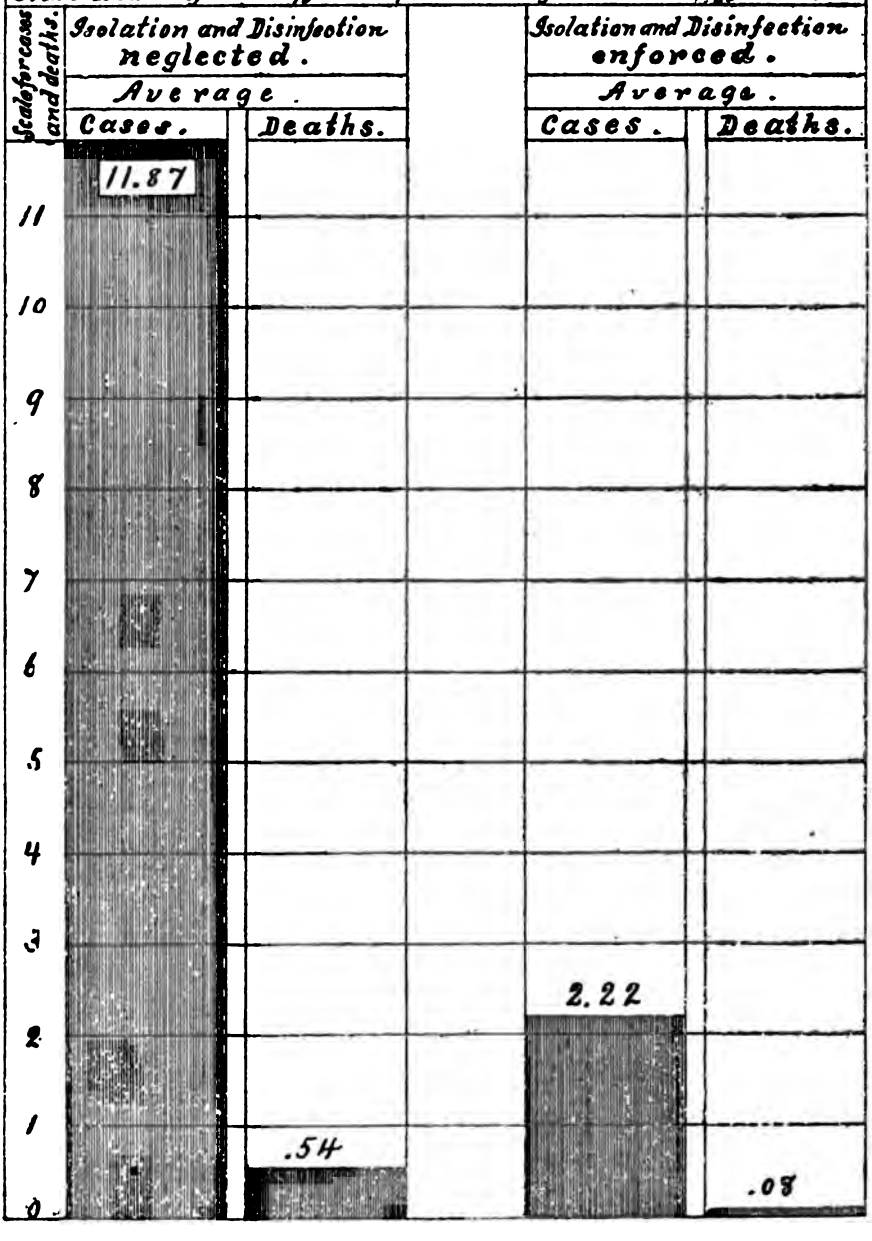
* The evidence for one year, 1888, is shown in the diagrams distributed here, and printed on page 27. Similar evidence relative to diphtheria is exhibited in the Diagram on page 28.

† You may be interested to know the method of estimating the number of cases prevented and lives saved by means of isolation and disinfection. It is as follows: Multiply the *whole number* of outbreaks by the average number of cases and deaths in the *neglected* outbreaks, and the product is the probable number of cases or deaths which would have occured if *all* outbreaks had been neglected. Deduct from this the number of cases or deaths which actually occurred, and the remainder is the indicated number of cases of sickness prevented or lives saved by the efforts made to restrict the disease.

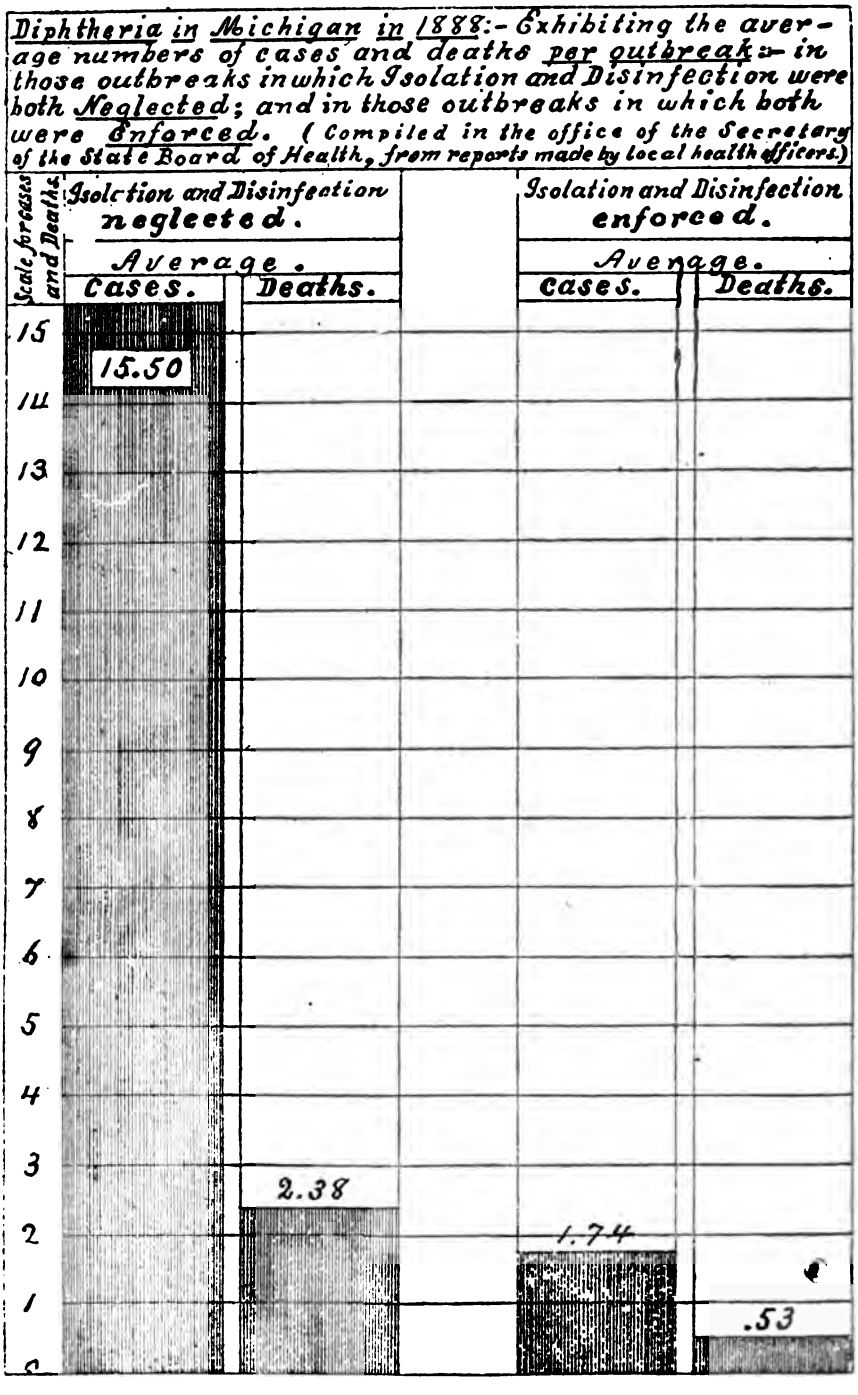
As the local health officers report to the State Board of Health the number of cases and deaths in outbreaks of diphtheria, and also report just what was done (in each outbreak) to restrict the disease, we are thus supplied with the data necessary to learn the success which attends any line of action which is taken. [The diagram on page — exhibits graphically the experience in restricting diphtheria in Michigan in 1888.]

ISOLATION AND DISINFECTION RESTRICT SCARLET FEVER

Scarlet Fever in Michigan in 1888:- Exhibiting the average numbers of cases and deaths per outbreak:- in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



ISOLATION AND DISINFECTION RESTRICT DIPHTHERIA.



The success which has already been achieved in dealing with scarlet fever, diphtheria and small-pox should encourage all to more thoroughly coöperate for the restriction of those diseases, and also to enter vigorously upon the work of restricting typhoid fever and consumption. The relative importance of these diseases can be seen by the diagram which is exhibted here.* I believe that one hundred lives per year have been saved from death from small-pox. The diagram is accurately drawn to scale, and correctly represents the relative mortality in Michigan from these important diseases which we believe are largely preventable. You can see for yourselves how much more important than small-pox some of the other diseases are, and the tremendous opportunity which there is for life-saving work for the restriction and prevention of the dangerous communicable diseases in Michigan. I do not see how one can have a better field or a nobler work, and I trust we shall all do what we can to forward the work. There is certainly room for all classes of workers, because *the subject of this paper, as expressed in its title, includes about all there is of greatest importance in sanitary science.*

Let us glance at a few of the many ways in which progress can be made in this work:—

1. Is it not true that the subject of "water-supply" is of importance chiefly with reference to one or more of these five most dangerous diseases?

We may grant if you please, that some deaths and sickness other than from these five diseases may result from impure drinking water, or if not actual deaths, uncomfortable sickness may result; but we must all admit, with Prof. Clark, that "The most uncomfortable thing which can happen to a man is to die,"† and so the most important reason why we should labor for pure drinking water is to prevent deaths from that disease (due to impure water) which causes the most deaths. Briefly, we need a pure water-supply chiefly to prevent deaths from typhoid fever,—one of the five diseases which causes the most deaths in Michigan.

2. Is it not true that the subject of "Ventilation" is of importance chiefly with reference to these five most dangerous diseases? We may admit that headache and many other discomforts may result from the breathing of bad air; but that "most uncomfortable thing" death, when caused through lack of ventilation or bad ventilation, is, I believe, most frequently due to one of those same five diseases which cause most deaths in Michigan. Excepting typhoid fever, which itself has sometimes been caused through bad ventilation or rather might have been prevented by good ventilation, all the other four diseases are most prevalent during or following the cold weather, that is, the season of the year when ventilation is poorest. Every one of these diseases is believed to be caused by a specific particle, usually called a "germ." These particles, given off from the sick person, are now known to be liable to cause disease somewhat in proportion to the number of them which gain entrance into the bodies of susceptible persons. Most of these germs get into our bodies by way of the air-passages. They go in with the air we breathe. To all persons who at any time come into a room in which there is one of these diseases the better the ventilation the less the danger of contracting each of these diseases. Proper methods of ventilation are especially important for the restriction of consumption. That

*This diagram is printed on page 18.

† Prof. A. Arnold Clark.

disease being most frequently spread by the dried germs which have been coughed up, spit upon the floor or handkerchief, become a part of the dust of the room, and, as such, breathed in and lodged in their favorite location,—if all such dust can be prevented from rising into the nostrils or mouths of occupants of the room, much will be done to restrict consumption. It is, therefore, of extremely great consequence that all opera houses, schoolhouses and other public assembly rooms shall have such a good system of ventilation that the current of all air in the room and all the dust which it contains shall be downward and out at the floor level, and not upward from the floor into the nostrils of persons in the room.

Ventilation is of the most importance with reference to this one greatest cause of death, this "great white plague" which is the cause of about one-eighth of all the deaths in Michigan. Ventilation is chiefly of importance with reference to those diseases which cause most deaths,—the most dangerous communicable diseases.

3. Is it not true that "the hygiene of schools" should be chiefly concerned with those diseases which cause most deaths? The diseases which have been most considered as spread in schools, in recent years at least, are: Scarlet fever, diphtheria, measles, whooping-cough, etc. To these we should now add consumption, and probably pneumonia, and, by reason of the drinking water and perhaps by reason of the disposal of excreta in or near school houses we may also add typhoid fever. This completes the list of the most dangerous communicable diseases.

4. Is it not true that "the disposal of excreta and waste" is of most importance with reference to these same "diseases which cause most deaths?" Here, however, we come to a subject which is most closely related to that disease which has been partially excepted from relation to some of the other subjects. I refer to typhoid fever, that disease which annually causes in Michigan probably a thousand deaths and ten thousand cases of sickness most of which we believe are preventable chiefly through proper disposal of excreta and the obtaining of unpolluted water-supplies.

5. Should not the "Duties and Compensation of the Local Health Officer" relate chiefly to these dangerous communicable diseases? The State law says yes; and you may be surprised to know that the law does not directly confer upon the health officer power to abate any nuisance; but it contemplates vigorous action for the restriction of "diseases dangerous to the public health." But as that subject is to follow this immediately, I will not elaborate this thought.

6. Should not the "Ideal Summer Resort" be so planned that life shall be most secure from those most dangerous communicable diseases?

7. I believe I have mentioned every theme upon the program of this convention, except the opening addresses, the prayer and the music, and I maintain that all these were good; but I am going to claim, or at least to ask you to admit that, so far as relates to this world, their utility consisted chiefly in the extent to which they tended to aid progress in restricting and preventing the dangerous communicable diseases, those diseases which cause most deaths in Michigan, and which, named in the order of their importance, are: consumption, diphtheria, pneumonia, typhoid fever and scarlet fever.

The discussion of this subject, by Arthur Hazlewood, M. D., member of the State Board of Health, Grand Rapids, Mich., was not reported, and is not here reproduced.

Third Session, Friday, August 15, at 9:30 A. M.

THE DUTIES AND COMPENSATION OF THE LOCAL HEALTH OFFICER

BY W. A. S. WILLIAMS, M. D., PETOSKEY, MICH.

The subject assigned me to present for discussion is styled, "The Duties and Compensation of the Local Health Officer." It does not seem necessary for one to read the law, nor to enumerate in detail the duties of the health officer, in fact this task can not be done, and for reasons which I will hereafter give you. The statute requires the health officer to perform certain duties and attaches a penalty for neglect to perform them; but, the duties prescribed by the statutes do not comprehend all his duties. There are duties which sometimes become apparent only under certain contingent circumstances and which duties can only be legally executed through powers conveyed by law and these are the duties the execution of which is often antagonized by public sentiment through transient excitement or from a lack of properly understanding those conditions which create a necessity for the immediate exercise of arbitrary power. I say arbitrary power, and I mean by that, the power to act at once and without interruption or delay; that is to say, without any writs of *habeas corpus* injunctions, stays, or any of those other legal proceedings that would stop for a time the operations of the health officer, and give the defendants a chance to defend themselves by showing their right to establish the business of distributing small-pox, diphtheria, etc., into your midst. Now this simple illustration will show you the necessity for immediate action and of not paralyzing the ends of usefulness and protection with these hindrances. It does not interfere with anybody's rights; it simply deters the spread and progress of dangerous diseases by giving a few men the power to act speedily and without interruption or loss of time. You of course know that there are always those who insist on not allowing any one to bless them, without a fuss,—very few though, I am happy to say, particularly if badly scared.

The local health officer should be a physician and surgeon and capable of producing evidence that his abilities have been tested by a lawfully constituted authority. He will be much less likely to make mistakes in diagnosis than some person having no other authority to practice than that of having taken care of a doctor's horse two or three times, and put up a sign. The woods in Michigan are pretty full of these and if the appointing power in cities and villages would make the evidence of a diploma essential to the appointment of a health officer, I think it would do much good and help the people, in securing at least a portion, of the required skill in diagnosis, and not only that but raise the standard which of itself would impress them with the importance of the position. At all events the health officer must of necessity be able to make early and correct diagnosis, of all the more important contagious diseases, for these are the most dangerous to the public health. He should be a man of good, sound sense and judgment, and especially one who will act, in obedience to the instructions of the State Board. Now in order to have the statutory powers successfully operated, it requires a man of courage and abilty and I wish to represent to you what kind of an individual the local health officer should be, and what qualifications seem requisite to make him an efficient operator of this invaluable law.

In the first place he should have the welfare of his fellow citizens at heart, and be a stockholder in the public health by having a family of his own, as it would add to his vigilance and activity in executing his duty. I am sure that on the occurrence of diphtheria or scarlet fever or any dangerous disease he would be more especially desirous to stay its spread, and perhaps he might be a little more careful about changing or disinfecting his clothing, than if an old bachelor without any of these motives.

He must be able to discriminate between measles and scarlet fever, or chicken pox and small-pox, or diphtheria and simple pharyngitis, etc., and not confound them, for one error in a case of small-pox alone would be followed by the most disastrous results not only to your business but to your lives, and here in Charlevoix to your reputation as a resort.

It is especially his duty to prevent, as far as is possible, the introduction of diseases from foreign sources and to prevent their spread, if by accident they happen to come. He must go to work judiciously and effectively, by separating infected persons from the public, and as many as he thinks dangerously exposed; notify the State Board of Health and obey their instructions to the letter without fear or favor, bring his knowledge of sanitary science into full force and effect; judiciously exercise the powers given him by the statute, and advise with authorities appointing him. It is his duty to explain the benefits of vaccination, and its unquestionable power in giving persons, if properly vaccinated, an almost certain immunity against small-pox; and under almost any circumstances of placing the system in a condition so protected that only a modified case would result from successful exposure.

A good, sound, health officer, could do much in removing an unfortunate superstition against small-pox by proper explanation and by always using vaccine virus from reliable sources. He should be at all times around and equipped with proper virus, ready to meet any sudden emergency and to be present at every meeting of the municipal council, to represent the condition of the public health and all that he requires to effectually operate the law. The fact is, he is, or ought to be, although appointed by that body, their superior in the skill required to make his appointment a benefaction to the public, and he must be sustained, and his advice followed or no good can result from his appointment.

Another important duty is to prevent, as far as possible, the occurrence of infectious and endemic diseases. He should examine all the water that is used by the public in general, hence he should be a chemist and know how to make analysis, and not be afraid to give proper information of the results of his investigations, and either condemn or offer suggestions. In Germany it is quite customary for a contract to be made with a family physician, paying him a proper sum annually for the ordinary medical attendance required by the family. It is then expected of him and it becomes his interest to examine the sanitary surroundings of the household, and to suggest any needed improvements. Hence a few such suggestions frequently prevent disease, saving much sickness and money. In America, the health officer should and is expected to make such suggestions, which will often prevent attacks of infectious or endemic diseases,—one of which would repay his annual salary, more than ten fold by reducing suffering and loss of time and money.

A health officer should have a good practical knowledge of plumbing work for water supply because if this apparatus is not properly constructed, trapped and ventilated, it becomes much more dangerous, and

productive of sickness, than would be the case in houses omitting it entirely. He should be well acquainted with the proper mode of arranging drains, trapping and ventilating them; with the dangers from cesspools, insufficient fall in sewers, etc., for sewer air is very liable to pass into the dwelling and become a source of disease.

A house with all the modern conveniences is a very dangerous habitation, unless properly arranged. He should understand the dangers to health resulting from dampness or springs in cellars, and from the evaporation of ground water, which passes up through the house, providing just the atmosphere necessary for the development of most diseases. He should call the attention of householders to the dangers in the disposal of wastes, especially from bed rooms.

If the investigations of modern scientists are to be accredited, very few persons realize the *dangers* from consumptive patients, or the fact that the sputa of patients is exceedingly dangerous, even after it is dried, and that if thrown out on the ground, it may be transmitted by the air, and start a new case. For the proper mode of neutralizing or destroying the specific germ of disease, the health officer must make suggestions such as are required for the case.

In brief it would be a very profitable investment for any town or city to employ a first-rate physician to devote his entire time to the duties of his position, paying him a proper salary therefor, and there would be no difficulty in proving that the salary was repaid tenfold each year by the saving of time usually lost by sickness, money paid for nurses, physicians and medicines, not including the loss of time of relatives or the value of the lives saved. The last would be no small item, for it has been estimated that it costs at least one thousand dollars to raise a man, and he certainly ought to be worth as much to the world.

A health officer ought to have a good knowledge of the entire domain of sanitary engineering so that he can intelligently decide on appliances or arrangements submitted for his examination. Let us consider for a moment the plumbing of houses, and the discharge of house wastes, into public sewers,—topics of increasing interest, since most cities are now building sewers; and, if dwellings are not properly connected with them, this will much increase, rather than lessen the danger from contagious diseases. Sewer gas is usually assumed to be the active agent in the transmission of certain diseases; but, it is only so when it contains the specific germ of that disease. If the sewers are of small size, have sufficient fall to insure rapid flow, and all sewage shall be discharged from them, before passing through fermentative or other changes, the danger from sewer gas will be far less, than in the case of too large, roughly constructed, or nearly horizontal sewers which retain the sewage until the number of disease germs has been infinitely increased. A very simple precaution will almost entirely prevent any possibility of the transmission of such diseases by means of sewer gas,—this is to collect in a proper receptacle all discharges from each *patient* suffering from a contagious disease, all water used for washing his body, clothing, etc., then sterilizing this, by thorough mixture with a suitable disinfecting fluid, before allowing it to pass into the sewer; but this is not always done, even in the larger cities.

In connecting a house drain with a sewer some means must be used for preventing the sewer gas from entering the house. Two good methods are in use. 1. Put in a trap in the house drain, as far from the house as possible, and ventilate it by a pipe of equal size extending to the top of the

ground and covered by a grating; or, (2) this pipe is sometimes connected to a rain water conductor. In England the sewer branch frequently ends in a grating at the top of the ground, outside the house, the house drain ending a foot or more above this, so that the two are entirely disconnected, but this would probably be impracticable in our climate. The house drain beneath the house itself should join a vertical soil pipe, or ventilating pipe of proper size which must extend above the roof and freely open into the air, to prevent the escape of any gas that may pass the outside trap or originate in the house drain. Each permanent fixture in the house, such as bath tub, water closet, wash-bowl, etc., must be connected with the house drain, or soil pipe by a waste pipe of proper size, a single trap being placed in each waste pipe between the fixture and the drain. Two traps are sometimes made instead of one, by accident or design, but obstruct the discharge and are inferior to a single one. *An untrapped waste pipe should be prohibited.* The greatest care is often necessary to see that a ventilating pipe does not serve as a bye-pass, and allow sewer gas to enter. These precautions appear to be very simple, and to be easily taken.

But we soon find a very serious difficulty, especially in houses having fixtures located on several different floors and which are connected to a common vertical soil pipe. If water be discharged from an upper water-closet, it acts like a piston in the soil pipe, compressing the air, and tending to force this through the waste pipes of the lower fixtures and into the rooms. If discharged from a lower water-closet its effect is to cause suction in the soil pipe, and to suck the water out of the traps, in the waste pipes of the upper fixtures, leaving free admission to the upper rooms for the sewer gas. The greater the number of stories in the building, the larger the number of fixtures connected with the soil pipe, and the smaller the diameter, and the greater the length of the soil pipe, the more certainly will the results here mentioned be produced. Various precautions are taken for obviating this danger.

1. The body of the trap is made much larger than the waste pipe, in order to prevent forcing or syphoning of the water-seal, mostly used for grease traps, because it is bulky and looks clumsy when in sight.

2. The trap is made very deep, so that the weight of water serves to retain the water-seal,—excellent but little used.

3. A loose ball or other mechanical means closes the trap, and prevents forcing; but permits sewage to pass through. This prevents forcing but not syphoning, is much used in various patent traps, but is not very reliable.

4. Each trap is ventilated by attaching to the top of the trap and between water-seal and soil pipe, an air tube, the same size as the waste pipe; this is carried to a vertical ventilating pipe, that extends above the roof—*never to the soil pipe.* This is sufficient for dwelling of moderate size, but not for apartment houses or office buildings of many stories.

5. Mr. Clellan's trap vent is attached to the trap, instead of a ventilating tube. It is a new appliance and is so arranged that any syphoning action lifts a valve from its mercury-seal and admits air to the trap; thus it prevents syphoning but not forcing, which might be obviated by using a ball trap.

Besides syphoning or forcing, a further difficulty occurs in the use of traps in waste pipes. If a fixture is not used for a considerable time in summer, the water in the trap gradually evaporates until the seal is broken,

and sewer gas freely passes into the room. Several methods are employed for preventing this result:—

1. A small supply pipe is run from the house water service, to each trap, the flow being controlled by a stop cock or ball cock keeping the water at a constant level. This prevents syphoning and evaporation is used in some of the best houses, but wastes water, is costly, and looks clumsy.

2. A quantity of mercury is poured into the trap, before it is set in place, sufficient to seal the trap even if all the water evaporates. When sewage passes through the pipe the mercury is forced aside, afterwards returning to its former place. But the mercury may *be gradually carried off* by solid matter in the sewage, leaving the seal broken by evaporation of the water.

3. When a house is closed, or the fixtures are not to be used for some months, the water is removed from the traps, by means of movable screws, which are usually placed on them in good plumbing, and the trap is filled with some other liquid which does not readily evaporate, which will not corrode the metal, and may easily be washed out,—such as cold saturated solution of salt, a mixture of glycerine and water, molasses or any non-drying, or heavy mineral oil.

4. Leave the water supply cock of the fixture slightly opened so as to permit the water to drip, which will do away with *syphonage and evaporation.* This will make the bad plumbing of most city houses considerably safer than if the cock be shut.

An additional source of danger, in house plumbing, becomes evident from the fact that, disease germs *are found to pass into water from sewer gas*; and then passing through from water into the air again, thus passing through the water seal of a trap. But the real magnitude of this danger, has not yet been determined, and it is probably very small in comparison with that resulting from an untrapped waste pipe. There appears to be but two modes of preventing this transmission of disease germs.

1. To arrange the plumbing so as to ensure the frequent change of the water in the traps, so that it may never become permeated with disease germs.

2. To pour some disinfecting solution into each fixture after using it, that this may overflow into the trap.

Every good thing possesses its benefits and its dangers, and the drainage of our dwellings is no exception to this rule. If this be carried out properly, as here suggested, our houses will become far more convenient and healthy than when no permanent fixtures and drains are used. If the system of plumbing and drainage be badly planned, or carelessly executed, it will only provide new channels for the admission of disease. Hence the need of an intelligent, and properly educated health officer, to see that the work is rightly arranged, in order to avoid the dangers here mentioned.

And now, ladies and gentlemen, in view of what has been said in reference to the duties of a health officer, the requirements of the law, the time that it takes, the qualifications it requires, the necessity for having such an officer, the protection his invaluable services afford to you; is it not just, right, and reasonable that he be properly compensated? See the difficulties he has to encounter, the dangers to which he is exposed in being required to go and investigate diseases from which everybody, except physicians, flee; and, then offer him an appointment loaded with the very gravest responsibilities with a salary, whose proportions would require the

aid of the the telescope in Lick's observatory to discover. Tell me why this is? I cannot tell. I have represented nothing to you but the naked truth, and I am ready to swear my witnesses, who will confirm every word by the utterances of natural law, whom none can set aside or evade. Must we look into the history of the past for the information that this human family would never allow anyone to bless them with reform without first buffeting him, or have we that evidence even today. Is human life of less value than material accumulations? A police officer to protect property while you sleep, a fireman to save your buildings from fire, are paid without hesitation a proper fee, and *so they should be.* If thieves break into your houses and steal your property, money would replace it; but, if the pestilence that walketh in darkness approaches your dwelling and robs you of your loved ones, the treasure of your hearts, tell me how you can remove that cloud or clouds from your minds, or replace those soul house treasures? Yet, this policeman who looks into that darkness, through the lenses of modern science, saves those precious lives and treasures, you refuse to give him, for a whole years's service, enough to bury one of his children should it die. Oh, wake up to this man's official importance, the blessing he is to you, the wisdom of our legislature in presenting him to you for your protection, and, here in Charlevoix, at least in this lovely resort town, where nature proclaims health to you. Oh, bid her to continue to come, through avenues of cleanliness, waters of purity, and currents of pure air; thus, protecting yourselves against the encroachment of disease, and giving sweet invitations to your friends, from afar, to come and take up their abode with you, and enjoy with you the blessings of your sanitary conditions and the salubrity of your climate.

FOURTH SESSION, FRIDAY, AUGUST 15, AT 2 P. M.

Some of the addresses and discussions which were on the progran of the fourth session, were given in the first session; and, the fourth and fifth sessions were consolidated and held in the afternoon of August 15, 1890.

Hon. John Avery, M. D., President of the State Board of Health, Greenville, Mich., gave an address on "Ventilation of Residences and Public Buildings," but the address was not in manuscript form, and is not here reproduced.

THE CAUSATION AND PREVENTION OF DIPHTHERIA.

BY ARTHUR HAZLEWOOD, M. D., MEMBER OF THE STATE BOARD OF HEALTH, GRAND RAPIDS, MICHIGAN.

Diphtheria is not a modern disease, although often spoken of as such. The name, derived from the Greek, meaning a membrane, was first given to it by the French physician Bretonneau, in 1821. Previous to that date, it was known as Egyptian sore throat, putrid sore throat, garrote, or the equivalent in the language of the people attacked. The description of the disease, however, tallies well with our modern diphtheria. It has long been considered a communicable disease, although observers have differed, as to its contagiousness or infectiousness. Until quite recently it was considered a filth disease, that is, produced by the presence of decomposing animal or

vegetable matter. This idea is not now entertained by advanced students, but has given place to the germ theory by which is meant the production of a disease by a specific germ or seed. I think Oertel was the first to demonstrate the presence of bacilli in the disease under consideration.

For many years the communicability of diseases such as small-pox, scarlet fever, measles, and influenza, (or the grippe or la grippe as we have called it here in the United States during the past winter), has been recognized, but the theory of the causes of communicability has varied with the stand point of the observer. It is unnecessary here to repeat these views. Of late years the germ theory of disease, and of many effects in nature, has been much expanded, and found to be so good a working hypothesis as to practically be considered the cause, especially as so many different germs have been discovered and have been cultured and found to induce pathological conditions similar to those present when first encountered.

You all know that, if you boil some fruit and have perfectly purified cans, and while the fruit is still boiling hot you hermetically seal the fruit in the cans, the fruit will keep without fermentation or decay for an indefinite period. A portion of the same fruit exposed in an open vessel for a few days will spoil. This difference in action, is brought about by the influence of germs always present in the atmosphere, because just such action is always going on around us, consequently such germs are always being produced, finding, as they do, sufficient food for growth and reproduction.

But the baker or housewife, desiring to produce bread leavened with yeast, does not depend upon the haphazard introduction of fermentation germs, and puts into the mixture of flour and water the yeast plant, which, by its rapid increase, favored from the presence of its natural food, aided by heat and moisture, produces a change in the starch particles of flour, evolving carbonic acid gas which in its efforts to escape produces the effect we call "rising of the dough." When this is sufficiently accomplished, the action of heat is used to stop it, and the bread is baked or steamed until cooked.

So, doubtless, disease germs of some sort are, at all times, floating in our atmosphere; but, unless the condition of our system is such as to serve as a garden for their growth, they produce no effect, no more than the tangible seeds of flowers will germinate, without suitable conditions of soil, heat and moisture. Biologists are now pretty well convinced: (1) That diphtheria is a germ disease, induced by a bacillus, named after its discoverers and propagators in the laboratory, Klebs and Lœffler; (2) that the germ is not always present in the atmosphere, and, therefore, not always a menace; (3) that the germ is easily transported, and propagated, under favorable conditions, and is destroyed by unfavorable conditions.

Diphtheria is essentially a contagious disease; this is established both by observation and experiment; it occurs especially on the mucous membranes of the mouth and throat, but may occur on other mucous membranes, or upon wounds of the skin.

"The virulence of the contagion is in proportion to the severity of the case from which it comes; the more it is allowed to collect in the room where the patient lies, that is, the less care bestowed upon ventilation, removal of the expectoration, and cleanliness in general, the more active does it become." The mildest case may, however, give rise to severe or fatal cases in others.

The Sanitary Journal of Scotland says "there are on record fourteen epidemics of diphtheria caused by milk." "In only one of the fourteen

epidemics was disease found in human beings at the dairy, prior to the outbreak among the customers, in another it attacked the customers and the dairy hands simultaneously. In five instances very gross unsanitary conditions were found at the farm, and in close relation with the milk." The observer noted especially untrapped drains or open drains permitting the effluvia to discharge over milk or milk vessels and suggests "that the specific bacterium got into the milk, and there developed in such abundance as to infect the consumers; although, in the free ventilation of the country it did not reach the residence at the farm in infective strength, as it more readily does in the confined and stagnant air of town houses." "In one-half of these (fourteen) outbreaks no explanation whetever seems to have even been suggested, and in two a peculiar inflammation of the cow's udder, called 'garget' was observed."

The following excerpts from a paper read by E. Klein, M. D., F. R. S., before the Royal Society, London, May 22, 1890, are of great interest:

"Mr. Power, in his report to the Local Government Board on the York Town and Camberley outbreak, states (page 13) that a veterinary surgeon had certified that the cows from whom the infected milk was derived were all in good health, but that two of the cows showed 'chaps' on their teats, and he adds that even two or three weeks after the epidemic had come to an end—the use of milk having been in the meanwhile discontinued—he saw at the farm one cow which had suffered chapped teats. At Enfield a veterinary inspector had also certified that the cows were in good health; but at Barking the veterinary inspector found sores and crusts on the udder and teats of the cows.

"I have made experiments on milch cows with the diphtheria bacillus, which appear to me to throw a good deal of light on the above outbreaks of diphtheria.

"Two milch cows* were inoculated with a broth culture of the diphtheria bacillus derived from human diphtheria. In each case a Pravaz syringeful was injected into the subcutaneous and muscular tissue of the left shoulder. On the second and third days there was already noticed a soft but tender swelling in the muscle and the subcutaneous tissue of the left shoulder; this swelling increased from day to day, and reached its maximum about the end of the week; then it gradually became smaller but firm. The temperature of both animals was raised on the second and third day, on which days they left off feeding, but after this became apparently normal. Both animals exhibited a slight cough, beginning with the eighth to tenth day, and this gradually increased. One animal left off feeding and ruminating on the twelfth day, 'fell in' considerably, and died in the night from the fourteenth to fifteenth day; the other animal on the twenty-third to twenty-fourth left off taking food, 'fell in' very much, and was very ill; it was killed on the twenty-fifth day.

"Unlike in the human, in the guinea pig and in the cat the diphtheria bacillus passed from the seat of inoculation into the system of the cow; this was proved by the demonstration of the diphtheria bacillus in the milk. But also in the eruption on the udder, the presence of the diphtheria bacillus was demonstrated by microscopic specimens and particularly by experiment. With matter taken from the eruption—vesicles and pustules—of the udder, two calves were inoculated into the skin of the groin; here the same eruption made its appearance: red papules, rapidly becoming vesicular, then pustular, and then became covered with brown-black crusts, which two or three days after became loose and left a dry healing sore behind. More than that, the calves that showed this eruption after inoculation became affected with severe broncho-pneumonia and with fatty degeneration of the cortex of the kidney. In the two cows above mentioned, on *post-mortem* examination, both lungs were found highly congested, œdematous, some lobules almost solid with broncho-pneumonia in the upper lobes and the upper portion of the middle or lower lobe respectively; the plural lymphatics were filled with serum and blood. Hemorrhages in the pericardium and lymph glands, and necrotic patches were present in the liver. At the seat of inoculation there were in both cases a firm tumor consisting in necrotic diphtheritic change of the muscular and subcutaneous tissue. In this diphtheritic tumour continuous masses of the diphtheria bacillus were present; their gradual growth into and destruction of the muscular fibres could be traced very clearly.

* The cows had been kept under obeservation previous to the experiment for ten days and were in all respects perfectly normal.

"It appears then from these observations that a definite disease can be produced in the cow by the diphtheria bacillus, consisting of a diphtheritic tumor at the seat of inoculation with copious multiplication of the diphtheria bacillus, a severe pneumonia, and necrotic change in the liver; the contagious nature of the vesicular eruption on the udder and excretion of the diphtheria bacillus in the milk prove that in the cow the bacillus is absorbed as such into the system.

"This bacillus diphtheria acts very virulently on guinea-pigs on subcutaneous inoculation; at the seat of the injection a tumor is produced, which in its pathology and in microscopic sections completely resembles the diphtheritic tissue of the human. In human diphtheria the diphtheria bacillus is present only in the diphtheritic membrane, but neither in the blood nor in the diseased viscera; the same holds good for the experimental guinea pigs. In subcutaneous inoculation with artificial culture, though it causes in these animals acute disease and death—the lungs, intestine, and kidney are greatly congested—the diphtheria bacillus remains limited to the seat of inoculation. It was for these reasons that Loeffler concluded that in diphtheria the diphtheritic membrane alone is the seat of the multiplication of the diphtheria bacillus, and that here a chemical poison is produced, which absorbed into the system causes the general diseased condition and eventually death. Roux and Yersin have then separated from artificial broth cultures the bacilli and the chemical products, and, by the injection of these latter alone into guinea-pigs, have produced a general effect. I have in this year's Report to the Medical Officer of the Local Government Board, 1889-90, shown that in these experiments of injection of cultures into guinea-pigs, an active multiplication of the diphtheria bacilli at the seat of inoculation can be demonstrated by culture experiments; from the local diphtheritic tumor and the nearest lymph glands the diphtheria bacilli can be obtained in pure culture on gelatine.

"On various occasions during the last three years information has reached me by Health Officers (Dr. Downes, Mr. Shirley Murphy, Dr. Thursfield) as to a curious relation existing between a mysterious cat disease and human diphtheria in this manner, that a cat or cats were taken ill with a pulmonary disease, and while ill were nursed by children, and then these latter sickened with well-marked diphtheria. Or children were taken ill with diphtheria, and either at the same time or afterwards the cat or cats sickened. The disease in the cat was described as an acute lung trouble; the animals were quiet, did not feed, and seemed not to be able to swallow; in some cases they recovered, in others they became emaciated, while the lung trouble increased, and ultimately they died. In one instance—in the north of London, in the spring, 1889—this cat malady, occurring in a house where diphtheria soon afterwards appeared amongst the children, was of a widespread nature; a veterinary surgeon—Dr. Daniel—informed me that at that time he had several patients amongst cats affected with the disease, consisting in an acute catarrhal affection, chiefly of the respiratory passages. He furnished me with two such animals; one that after an illness of several weeks had died, another that was sent to me in a highly emaciated state, affected with broncho-pneumonia; this animal was paralyzed on the hind limbs. In both instances the *post-mortem* examination showed severe lung disease, broncho-pneumonia, and large white kidneys due to fatty degeneration of the entire cortex. A similar condition is met with in the human subject in diphtheria. Further, I received from Dr. Thursfield, of Shrewsbury, the body of a cat that had died after a few days' illness from pneumonia in a house in which children were ill with diphtheria; another cat in the same house that became next ill with the same lung trouble also succumbed. The *post-mortem* examination of the animal that I received showed severe broncho-pneumonia and large white kidneys, the entire cortex being in a state of fatty degeneration.

"Subcutaneous inoculations of cats were carried out with particles of fresh human diphtheritic membranes and with cultures of the diphtheria bacillus (Report of Medical Officer of the Local Government Board, 1889-90); thereby a local diphtheritic tumor was produced at the seat of the inoculation, and a general visceral disease; in the cases in which death followed after a few days the lungs were found much congested; when death followed after one or more weeks, the lungs showed broncho-pneumonia and the kidneys were enlarged and white, the cortex being in a state of fatty degeneration; if the disease in the animals lasted beyond five to seven days, both kidneys were found uniformly white in the cortex; if of shorter duration, the fatty degeneration was sometimes only in patches. Although in these experiments the bacillus diphtheriæ was recoverable by cultivation from the diphtheritic tumor at the seat of inoculation, there were no bacilli found in the lungs, heart's blood, or kidney, and the conclusion is justified that, just as in the human diphtheria and in the diphtheria produced by subcutaneous inoculation in the guinea-pig, so also in these experimental cats the visceral disease must be a result of the action of a chemical poison produced by the diphtheria bacillus at the seat of inoculation.

"From this it is seen that the similarity between the artifical disease and the natural disease in the cat is very great, and the question that presents itself is, In what manner does the animal receive or give the diphtheritic contagium in the natural disease? The natural disease in the cat is in its symptoms and pathology a lung disease, and it is reasonable to suppose from analogy that the lung is the organ in which the diphtheritic process in the cat has its seat. The microscopic examination of the diseased lung of cats that died from the natural disease bears this out, the membrane lining the bronchi in the diseased portions of the lobules presenting appearances which in microscopic character coincide with the appearances in the mucous membrane of the human fauces, pharynx, or larynx in diphtheria. But the correctness of the above supposition, that diphtheria has its seat in the lung of the cat naturally diseased, was proved by direct experiment. Broth culture of the bacillus diphtheriæ was introduced into the cavity of the normal trachea without injuring the mucous membrane. The animals became ill with acute pneumonia, and on *post-mortem*, two to seven days after, there was found extensive pneumonia, and fatty degeneration of the kidney. The bronchi, infundibula, and air cells of the inflamed lobules were found occluded by, and filled with exudation, which under the microscope bears a stirking resemblance to human diphtheritic membranes, and in the muco-purulent exudation in the large bronchi and trachea the diphtheria bacilli were present in large numbers."

The methods of transmission from patient to patient are numerous: (1) The Conneticut Board of Health Report, for 1889, cites a case conveyed by clothing, and a second case from a nurse probably through clothing; (2) by one child chewing gum which a convalescent child had been chewing; (3) by a case mistaken for mumps; (4) by contact with children convalescent two or three weeks after recovery; (5) by inhabiting tenements where the disease had been, without proper disinfection; (6) books used by children during convalescence are supposed to be the purveyors of the disease to other families.

The following is only one of many cases, where public funerals or exposure of bodies dead from the disease, has been the cause of contagion.

How diphtheria is spread by corpses.

In March 1890, two corpses, woman and children of same family, dead of throat disease, were conveyed from Montmorency county to Lapeer county, Michigan, where just one week from the day the coffins were opened and the remains were viewed, a person who was thus exposed came down with diphtheria. Many others would probably have been exposed except for the action of the local health officer Dr. C. A. Wisner, who, suspecting that the cause of the death was diphtheria, warned the neighbors and forbade the opening of the coffins at the funeral. He promptly isolated the first case that occurred, and no epidemic resulted. This is quite different from the result of a similar occurrence in Zanesville, Ohio, last Spring, where many deaths resulted from exposure to a corpse brought from Chicago.

It was diphtheria that killed them, in Montmorency and Otsego Counties.

The outbreak of dangerous disease which has prevailed in Otsego and Montmorency counties since last Spring, and which local physicians said was not diphtheria, and permitted two of the corpses to be sent to Lapeer county, where a case of diphtheria occurred in a person who viewed the remains, has been investigated by the State Board of Health, the investigation having been requested by a union meeting of the boards of health of the three townships in those counties.

Prof. Vaughan of the University, a member of the State Board of Health, went and made the investigation. He has also made bacteriological examination of the membrane from the throats of two of the patients, and has found and propagated the micro-organisms which are believed to cause diphtheria. This species of micro-organism is known as Löffler's bacillus. Prof. Vaughan says: "The bacilli have been compared with the Löffler bacillus, which I had obtained in the laboratory of Dr. Koch at Berlin and the indentity of the two cannot be questioned." He reports the disease to be unmistakably diphtheria, as proved by symptoms, physical signs, throat paralysis, etc., and the diagnosis is sustained by the bacteriological examination. It is now hoped and expected that the local authorities will take thorough measures, and stamp out the disease.

OFFICE OF THE STATE BOARD OF HEALTH,
Lansing, Michigan, July 22, 1890.

HENRY B. BAKER,
Secretary.

What shall we do to be saved from diphtheria? I answer in three words, prevent, isolate, disinfect. Under the first head—I have great faith in the resisting power of a healthy constitution. Our bodies have the power to destroy, to some extent, the disease germs coming in contact with them, but to do this effectually a vigorous state of health is needed; also, freedom from cuts, sores or other breaks in the skin or mucous membranes. This condition of health we maintain by proper care of our persons and surroundings; by temperance in all things—eating, drinking, smoking, dancing or other forms of dissipation, by taking sufficient sleep, by daily bathing in tepid water, by out-door exercise suited to the strength of the individual; in short to render our bodies able to resist disease, just as a military fortress well built, guarded and manned, is able to resist attacks of outside foes.

But, when the disease attacks us and finds a lodgment, are we to allow it to have its own way and strike down one after another of our dearest and nearest according as it listeth? A thousand times no! Forwarned is forearmed. We do know how to prevent its spread, we do know how to destroy its action, at least beyond the first victim, but, unless we do our best, we can blame no one but ourselves for the mishaps.

If a fire occurs in your vicinity every one feels in duty bound to at once endeavor to quench the flames, to prevent further destruction of property and may be of life. We are not willing to sacrifice life to save property from fire. Why should we be in the presence of disease? I think, it must be because many of us are not certain that restrictive measures will prevent. Yet it has been demonstrated, as thoroughly as any thing of the kind can be, that isolation of all cases, and disinfection, does and will continue to prevent the spread of this dire disease.

The diagram*, is of itself a sufficient proof, and the testimony of health officers given at the meeting of the American Public Health Association in Brooklyn last year, was also confirmatory. Later experiments in France concerning the action of sulphur fumigation prove the destruction of vaccine virus and presumably of diphtheria also.

How are these magic wands—*isolation* and *disinfection* to be obtained and applied? By having an effective health officer paid a salary by the citizens just as you pay a chief of police or fire department, whose duty it shall be to ascertain removable causes of disease, and whose authority in such matters shall be recognized equal to any officer of your corporation.

The efficiency of the health officer should be determined, not by the number of outbreaks speedily and effectively ended, but by the absence of disease or as some would say, by the office being a sinecure. In towns and villages such officers are not needed to expend their whole time in the duties mentioned, and in some instances perhaps are not appointed—whenever fire is called, all take part in one way or another in overcoming it. But with this disease as well as other contagious diseases, the trouble may be wide-spread before discovery. The annual cost of an efficient fire department in a city of moderate size, is about as many dollars as there are units in population and the police department equally as much; yet, where will you find a like sum appropriated for health purposes? Are the lives of people of less money value than the destructable property belonging to them?

When preventive measures have failed to hinder the introduction of the

*The diagram, "Isolation and Disinfection Restrict Diphtheria," is printed on page 28.

pest, notify the health officer of the fact as soon as it is known, or as soon as suspicion points that way; carry out the directions to isolate the patient and all other persons who may have been exposed; call your physician, and have the case treated at once; and during the treatment use such disinfectants as are recommended by the health officer.

After the disease is ended, I hope favorably to those attacked, disinfect! *disinfect!* DISINFECT! Not by making believe; but thoroughly under the supervision of the health officer making him responsible for the effectiveness of these final measures—one or more cases in the one house should end the attack; and in case of death from diphtheria, let the funeral be private, and the directions of the State Board of Health for such circumstances be closely followed.

You know you can not afford to allow even a bonfire, made for the necessary burning of rubbish, to go without supervision lest it spread to occupied buildings or warehouses, entailing loss of wealth. No more should you allow one case of sore throat, no matter how slight or insignificant, to go without careful investigation "Eternal vigilance is the price of liberty" and it is also the price of life and health.

THE CAUSES AND PREVENTION OF CONSUMPTION.

BY WILLIAM E. ZIEGENFUSS, M. D., ALPENA.

Before the watchmaker can intelligently repair a fine Howard or Elgin movement, he must be able to discover the cause of the defect. The ladies here would scarcely take a fine silk dress to a dressmaker to have some alteration or change in the fit and appearance of the garment made, unless they, or the dressmaker, knew in what particular the dress failed. Here is a man with failing eyesight, he can scarcely read now, and straightway hurries off a messenger for the family physician. He comes, examines the eyes, perhaps knowingly, and wisely nods his head, and deliberately writes a prescription for some of his famous eyewaters. This is procured, faithfully applied as directed, but the man gradually becomes more blind. He now cannot see to go about his own yard and attend to his duties. There is darkness for him, and gloomy forebodings for his friends. Some one suggests that he go and see Dr. So & So, the eye specialist. This is done. The Doctor with the aid of the ophthalmoscope discovers peculiar changes in the retina and optic nerve due to some toxic influence. This toxic agent may be due to ureamia, tobacco, or alcohol. He now calls to his assistance the aid of the test tube and the microscope, and soon discovers the true cause of the blindness to be ureamic poisoning. The proper remedies soon remove the cause, and the sight returns. The expert watchmaker, the artistic modiste, and the accurate and scientific physician all succeeded because they knew where the cause of the trouble resided and what to do to remove it.

But you say, what has this to do with consumption? Only to impress upon your minds the fact that before a disease can be scientifically and successfully treated the causation must be discovered. The cause of *this* disease has been a mystery for ages, but I am happy to say that at last it is believed beyond a doubt that the true cause has been found. I am not expected to give more than a running sketch of the cause and its discovery. Many theories have been advanced, and causes suggested, some of them partly true, others purely fanciful. The only theory based on facts, and

which the scientific world today is accepting with almost universal unanimity, is one of gradual evolution, the history of which may be of interest to you.

In 1700, Manget stated that in the dissection of a person who had died of consumption he discovered small nodes or solid bodies of the size of millet seeds, in the lungs, liver, spleen and kidneys. These small bodies are called tubercles.

Stark, in 1785, gave a complete description of these tubercles, and Ried, in the same year, claimed they were not enlarged lymphatic glands, as had been claimed by some, but independent formations in the substance of the lungs.

Bayle and Laënnec, in the early part of our century, did much to simplify this question. But Virchow, perhaps the greatest of all great German pathologists, did more than any of his predecessors to bring clearly before the world the ideas which had been advanced. He believed in the infectious nature of consumption. Many experiments been been made by introducing tuberculous matter into the lower animals for the purpose of determining whether they could be infected with the disease. This was so successful that, in 1864, Villemin expressed the belief that it was an independent disease; as much so as small-pox, scarlet fever and cholera, and could only be produced by the introduction of tuberculous matter from man to the lower animals, or from one animal to another. This was the signal for renewed energy among scientific men. This was a new doctrine. Was it true?

They exerted their utmost powers to either prove or disprove it. Experiments were made with tuberculous matter for the purpose of infecting other animals, by inoculation, by inhalation and by feeding. Without going into the details of these experiments I would say that with scarcely a dissenting voice, the result was that the doctrine was true.

In March, 1882, Dr. Robert Koch of the Imperial Board of Health of Germany, read a paper before the Physiological Society of Berlin, in which he detailed his experiments, and showed beyond a doubt the presence of the micro-organism, which he called bacillus tuberculosis, and that this was the pathogenic cause of the disease.

The record of Koch's work, found in the second volume of the Imperial Health Reports, shows that, after the inhalation of material from consumptive patients, the rabbits and guinea-pigs under observation had, within twenty-eight days, tubercles throughout the lungs of all of them, and in the liver and spleen of some.

It was only last week at the World's Medical Congress, now in session in Berlin, that Dr. Koch read an exhaustive paper giving further proofs of his theory first announced in the same city eight years ago. Although not having had time to read the full paper, the press of this country gave enough to show that he has by no means had reason to change the opinion then advanced.

In experiments made by Tappeiner in 1883, tuberculous sputa being inhaled by eighteen healthy dogs, tubercles in both lungs and pleura were afterwards found in seventeen. While he was making these tests, one of his servants, a robust man of forty, was deriding the idea that there was any danger in these sprays and, in spite of warnings, he went into the room, breathed the vaporized sputa, and got the consumption, the same as the dogs did. In three months and a half he was dead, thus furnishing

one of the strongest proofs in favor of the infectious and dangerous nature of the sputum from consumptives.

The carefully-conducted investigations of Cadeac .and Mallet, recently published, show that while no positive result was obtained from compelling rabbits and guinea-pigs to inspire air exhaled by consumptive patients, yet while air was used collected near the beds of hospital inmates, two of the guinea-pigs acquired tubercle. The air near the patients probably contained particles of sputa.

The only experiment, so far as I know, upon a human subject was made by Drs. Demet, Paraskeva and Zallonis, in Syra, Greece, who inoculated with sputa from a phthisical patient, a man whose history afforded no suspician of tubercle, and whose lungs were healthy, but who had gangrene due to femoral embolism, and who would not permit amputation. Thirty-eight days after the inoculation the man died from gangrene, when it was found that the upper lobe of the right lung had seventeen tubercles, and there were two granulations in the apex of the left lung.

These examples are quite enough, and we will now, for a few minutes, look at the manner in which the disease is conveyed.

I have tried all along to leave the impression that there was a micro-organism, the *tubercle bacillus*, in the expectorated sputum of consumptives, which was the cause of the disease. Bear this in mind, and what follows will be clearer.

I can do no better than repeat what our efficient secretary of the Board of Health, Dr. Baker, said at the Vicksburg sanitary convention:

"1. Probably by far the most common mode of spread of consumption is by means of dust from the dried sputum spit out by consumptive persons.

"2. When this dust is breathed, the danger of its active principle being able to reproduce and cause consumption, in the person who has inhaled it, is not as great among persons who are well nourished and in vigorous health, and whose air-passages are free from inflammation or abrasion, as among persons not in such condition.

"3. The specific cause of consumption may enter the human body with the food or drink, in which case the danger of its being able to gain a lodgment, and to increase within the body and cause the disease, is not as great to those who are in perfect health, and whose alimentary canal is sound throughout as to those who are not in such good condition.

"4. The dried sputum is not the only source of consumption. The milk and the flesh of animals that have this disease frequently contain the specific cause of the disease."

In two ways mainly then, consumption is contracted—First, by air carrying particles of disease into the respiratory tract. Second, by food from infected sources, through the alimentary tract.

I would not be misunderstood. I do not think that, as yet, we can sustain the statement that consumption is contagious, acquired by mere contact. But I do hold that particles of matter from the site of disease in a consumptive patient may be carried, planted in a suitable soil, and produce the disease in persons previously in a healthy condition,

Any irritation either in the respiratory or alimentary tract, or open fresh wound may form the suitable soil.

Thus I have briefly narrated the cause of the disease that carries off

one-seventh of our fairest population, and have also stated the manner in which it is chiefly transmitted from one to the other.

But some one says, "You did not say anything about hereditary consumption." True, I did not, for the reason that, so far as we know, there is no such thing. The predisposition to the disease, or rather the *liability* to contract it, in other words, only the weak resisting powers of certain natures, is what is known as inherited consumption.

It is by no means true that all those who inhale the poisonous element fall victims to its powers. The fact is patent that we must all, at some time or other, inhale the microscopic germs of consumption, but not finding a suitable soil for lodgment and development they are expelled, and no harm results. Just what constitutes this suitable soil we cannot say yet. There is inherent in all animals, and manifest to a greater or less degree, a physiological resistance to all infectious diseases.

This resistance is due to cellular action, but just how, we do not know. Suffice to say, when large numbers of these bacilli are inhaled at a time when this cellular resistance is weakest, disease is apt to follow.

The old doctors often warned you not to neglect a cold, for it might run into consumption. You know many cases where this has apparently been the case; the seeds of the disease may find a suitable soil there, or, having been surrounded by healthy tissue for a time, a cold and somewhat prolonged bronchial irritation may have liberated them, when they go on multiplying rapidly, and destroy the tissues.

There is no longer any excuse for the really scientific and skillful physician to grope along in darkness as to the diagnosis in cases of consumption. The microscopical examination of the sputum will tell the story. The diagnosis can be made in this way long before there is destruction enough to be determined by means of auscultation and percussion.

I am warned that the limit of time for this paper is up, and will only add a few lines on prevention.

I think it is plain to all who listened to this reading that the seed of consumption lies chiefly in the expectorated sputum of those having the disease. That this seed, when dried, lives over 180 days, and in a moist, putrifying substance, 43 days. That the chief avenue of entrance into the system is the respiratory tract. Hence the logical and only reasonable plan of prevention is the destruction of the germs before they become a part of the dust in the air we breathe. The consumptive must be taught to destroy his sputa, thus cease or lessen the degree of poisoning the air. Heller claimed that a person with consumption would expectorate 7,200 million of these bacilli a day. Destroy these and you become a benefactor to your race.

Furnish spit-cups for the use of consumptives, fill these partly with water containing about ten grains of bichloride of mercury to the pint. This will thoroughly disinfect the sputum, and no harm will thus result. Those persons who have the disease who still walk our streets, and occupy our churches and opera houses, should use paper or cloths to receive their expectorations, and then burn these before they become dry.

"He should do this for his own good, because when he continues breathing the germs of consumption from his own sputa, he continually re-infects himself, and thus diminishes his chances of recovery. But more than this, the people should demand it for their own safety. It is more important than to fortify our bodies."*

Every day in the week and every hour in the day, one unfortunate citi-

* Prof. A. A. Clark.

zen in every seven is scattering these seeds of destruction to the winds and the breezes, and this surely means a blighted life and an early grave to some unfortunate brother or sister.

The great "Reaper whose name is death" comes daily and hourly to gather where ignorance had sown the seed.

Stop sowing the seed, and the disease will stop destroying our fairest and best, at the rate of 150,000 a year in the United States.

If consumption carries off one-seventh or more of our population, and is assuredly infectious, is it not a proper disease for sanitary regulations and restraint? Are we not as much bound to protect against the bacillus of tuberculosis as against the bacillus of diphtheria, the bacillus of typhoid fever or the germs, of whatever name, of small-pox, scarlet fever and cholera?

Is it not as wide-spread, as sure in its effects, and as disastrous in its waste of human lives?

Ought we not to point out to the wife the hazard in watching by the bedside of a consumptive husband, and the peril of occupying the same bed and room? The hazard differs only in the swiftness of coming consequences.

The subject "the causes and prevention of consumption" was discussed by Victor C. Vaughan, M. D., member of the State Board of Health, Ann Arbor, Mich.; but there was no report of the discussion, and it is not here reproduced.

B. P. L. Bindery,
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